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JANUARY, 1923

Vol. XL. *No.* **147.**

THE

BRISTOL MEDICO-CHIRURGICAL JOURNAL

PUBLISHED UNDER THE AUSPICES OF

THE BRISTOL MEDICO-CHIRURGICAL SOCIETY.

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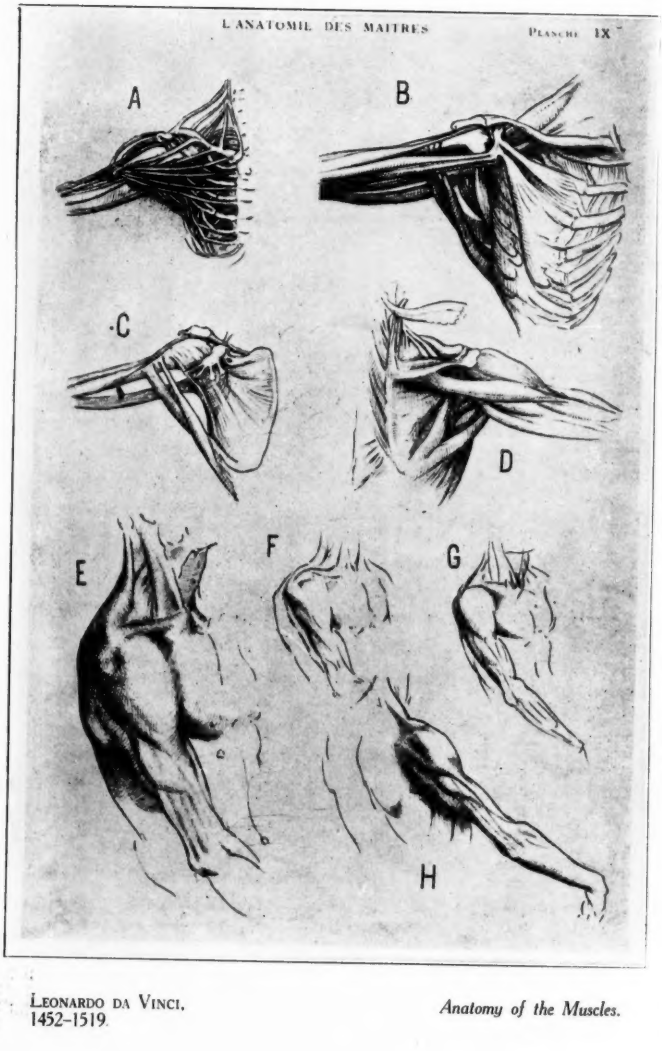
PLATE I



LEONARDO DA VINCI,
1452–1519.

Anatomy of the Muscles.

The Bristol Medico-Chirurgical Journal

" Scire est nescire, nisi id me
Scire alius sciret.

JANUARY, 1923.

THE DEBT OF MEDICINE TO THE FINE ARTS.

The Presidential Address, delivered on October 11th, 1922, at the opening of the Fiftieth Session of the Bristol Medico-Chirurgical Society.

BY

J. A. NIXON, C.M.G., M.D. Cantab., F.R.C.P.,

Physician to the Bristol Royal Infirmary, Consulting Physician to Southmead Infirmary.

THE subject of this address was suggested by a remark in a paper read at the International Congress of Medicine in 1913. Dr. Corson was discussing the artistic powers of Sir Charles Bell, " who," he said, " thought anatomy of great use to the artist." Then he added, " But a great book is yet to be written on the value of art to anatomy and medicine." Although the book has not been written, the evidences of this value of art to medicine are scattered freely through the whole of its history, and there can be no gainsaying that the fine arts have played an important part in the general advance of medical knowledge and in the progress of what is called science. I had often wondered

whether there was not some almost miraculous inspiration as yet unaccounted for that caused the evolution of scientific medicine from the welter of superstition and magic in which the healing art originated.

From all we learn by the study of medicine as practised among primitive tribes, or by the study of its earliest traces in prehistoric times even into the dawn of history, it is clear that nothing approaching a scientific spirit existed in medicine before the era of the Greek philosophers. Medicine before the golden age of Pericles was little more than a medley of wonder-working and miracle-mongering practised on a superstitious public by a caste of priestly quacks.

Philosophy began the work of freeing medicine from the delusions of superstition, but it failed in a large measure because it substituted errors of hypothesis in their place. All the real progress in medicine has been due to men who, being by nature richly endowed, like artists, with keen gifts of perception, have retained these gifts undulled, together with the Hippocratic secret of vivid mental imagery.

Hippocrates infused a wholly new spirit into medicine when he discarded both superstition and hypothesis, introducing in their stead the results of actual observation. Khalif Ali, the son-in-law of Mahomet, said that "men are more like the times in which they live than they are like their fathers." It is to the times in which he lived that we must look for an explanation of Hippocrates' supreme gift to medicine. Had he lived in an environment of fanaticism and ignorance, the Father of Medicine might have dealt, like his forerunners and contemporaries, in therapeutic magic and spells.

But the Greeks of the fifth century B.C. were distinguished by intellectual acuteness and artistic gifts, a fertile combination for the growth of science. Hellas possessed men of a new sort. Hitherto superstition and fear, going hand in

hand had sufficed to prevent natural curiosity from exploring the paths of scientific enquiry into natural phenomena. Curiosity unaided by acuity of perception remains timid and prone to accept supernatural explanations of the phenomena it witnesses.

"Progress was at last made in the art of medicine because the physicians of Greece shared with her poets and sculptors the same splendid faculties of keen sight and faithful reproduction of the thing seen." Flinders Petrie has pointed out that in successive civilisations there has been a fairly regular sequence in the development of the various branches of human activity. Art appears first, notably sculpture and architecture, literature follows later, and last of all science.

As we read the Hippocratic writings we realise that the acuity of observation that Praxiteles and Pheidias brought to their masterpieces of sculpture finds expression in the Hippocratic description of clinical cases. The theories of Hippocrates were admittedly as speculative and erroneous as any, but when he confines himself to simple observation of patients and their behaviour the artistic perception breaks out. He had a descriptive faculty which has never been approached for excellence, he saw with the eye of an artist. Who but an artist could have described approaching death as he saw it: "A face with sharp nose, hollow eyes, sunken temples; the ears cold, contracted, and their lobes turned out; the skin of the forehead rough, distended, parched; the colour of the whole face being green, black, livid or lead-coloured." Hippocrates had the good fortune to be living in the age of Pericles, one of those rare epochs when "artists, philosophers and men of action cease to live in isolation, but breathe a common air and catch light and heat from each other's thoughts."

As the light of Greece grew dim the intellectual centre

changed to Alexandria, where science and medicine, if they progressed at all, did so in the Hellenistic colony in Egypt. But the progress made was small, just as we find that art in their hands soon became stationary and decadent.

In Rome, too, all that survived of science and medicine was a mere thread of Greek tradition. Roman art was in the main degenerate Greek art so far as concerned the plastic and æsthetic arts. Rome was interested chiefly in the arts of government and war, the arts of peace were subjugated under her iron sway.

To Egypt and Rome succeeded the Arabian, Mohammedan or Saracenic dominion. We know that the Arabians preserved for coming ages the literature of Greek medicine. But the Greek spirit was dead, they contributed nothing to the advancement of medical knowledge. Rhazes alone of them, perhaps, observed originally and gave us measles and small pox. Their own writer, Ibn Khaldun, summed them up: "Of all the people in the world they are the least capable of ruling a kingdom, of all the people in the world they have the least aptitude for the arts."

Medicine, in fact, stood still until the fourteenth century, when the remarkable revival of learning in Europe took place. This revival corresponded with (I will not say was caused by) a re-introduction of Greek literature and learning.

Voltaire attributed the rising genius of the Italians to their new-found wealth and liberty, pointing out that before the remains of Greek learning removed from Constantinople into Italy Brunelleschi began to revive the ancient taste in architecture, Giotto brought the freshness of the moderns combined with the vigour of the ancients into painting, Boccaccio established the Italian language, and Guido of Arezzo invented the new method of musical notes. He would not admit that it was to the refugees of Constantinople we are indebted for the "resurrection of

letters." "Those men," he says scornfully, "were capable of teaching the Italians nothing more than the Greek tongue."

It is hard to imagine that the last Greeks of Byzantium were really capable of arousing a sudden flood of genius in Western Europe. Nor is it true that the essentials of the Hippocratic treatises had ever been lost. They were extant and uncorrupted throughout the whole of the Saracen dominions; that is to say, the texts were extant, but the spirit was lost.

I think the Renaissance did not revive medicine by restoring Greek writings. If the Greek classics restored anything it was the feeling for the æsthetic arts, but this feeling had already come into being.

Had the master minds of the Renaissance confined their studies to Greek history alone they would have found it a lamentable record of petty strife and treachery, redeemed here and there by some noble and heroic action, but they would have learnt little of the marvellous achievements of the Greeks in the realms of thought and art. "What," asks Professor Andrewes, "does the Peloponnesian War matter in comparison with the invention of mathematics, the development of the drama, or the idealism of Greek sculpture?" The Middle Ages were dark not because the history of Greece had been forgotten but because the art and culture of classical times had been lost. When Europe began to shake off the fetters of ignorance art was the first fruit of the revival. Sculpture and architecture were almost at their zenith in the thirteenth century. Painting lagged nearly two centuries behind. Close on the heels of painting came anatomy, the first of the sciences to free itself from the bondage of antiquity.

The study of anatomy by actual dissection and first-hand observation began indeed with Mondini, who died in

1318. His work was devoid of illustrations or references to diagrams.

Henri de Mondeville is said by Guy de Chauliac (one of his pupils) to have illustrated his demonstrations of anatomy by pictures or diagrams thirteen in number.

When we reach the fifteenth century, however, we are suddenly confronted by the mighty genius of Leonardo da Vinci (born 1452). Leonardo not only studied the anatomy of the human figure for the improvement of his art as painter and sculptor, he brought to the study of anatomy his unrivalled perception as an artist. He not only collaborated with the anatomist Della Torre by illustrating the celebrated anatomical treatise of the latter, but wrote on anatomy from his own observations. In Windsor Castle is a MS. of his anatomical drawings with the explanatory text written in the singular " mirror-writing " that he affected. This is part of a purchase made for King Charles I., possibly acquired for him by the sound judgment of William Harvey. Amongst these are a series of drawings of the bones and muscles, to which he added analytical diagrams for the demonstration of muscular action. (Plate I.)

Leonardo's Windsor MS. was thus described by Robert Knox in 1852 :—

" It is a small folio, prepared as a sketch book, its leaves filled with figures drawn by Leonardo, chiefly from dissections either made by himself or conjointly with Della Torre . . . in no instance could I perceive that Da Vinci ever mistook the dead for the living. As if to secure himself against the possibility of such an occurrence, he has drawn generally, and with a grace and spirit not to be surpassed, the living limb, with all its glorious exterior side by side with the dead and dissected corse. He draws the dead as dead—the living as living. . . . I stumbled on a drawing of the semilunar valves of the aorta in a variety of positions, so

From the *Windsor MS.*

LEONARDO DA VINCI.
1452–1519

as to show their descriptive anatomy and their physiological action. The corpuscules of Arantius have not been forgotten. Now all this occurred long before the age of Fabricius and Harvey : and even before that of Vesalius." (Plate II.)

Unfortunately, the work of Leonardo lay forgotten or lost, so that his influence upon medical science was negligible. None of the books on anatomy, surgery or medicine which belong to the period just after Leonardo's show either anatomical accuracy or artistic merit, although the period was one in which artistic talent abounded.

At the date of Leonardo's death, in 1519, Raphael was approaching the end of his labours (he died in 1520) ; Michelangelo, however, was living, and continued his great work till his death in 1564 ; Benvenuto Cellini was born in 1500 and died in 1571. This was an age of marvellous intellects—Erasmus, Thomas More, Copernicus, and Luther. Columbus, too, had just discovered America (1492).

Yet medical science seemed to derive little profit, unless the foundation of a College of Physicians in London by Linacre or the establishment of lectures on human anatomy in Cambridge by John Caius should be ranked as events of first importance. The best-known name of this period is that of the half-crazy charlatan Paracelsus, on whom the mantle of Leonardo most emphatically did not fall.

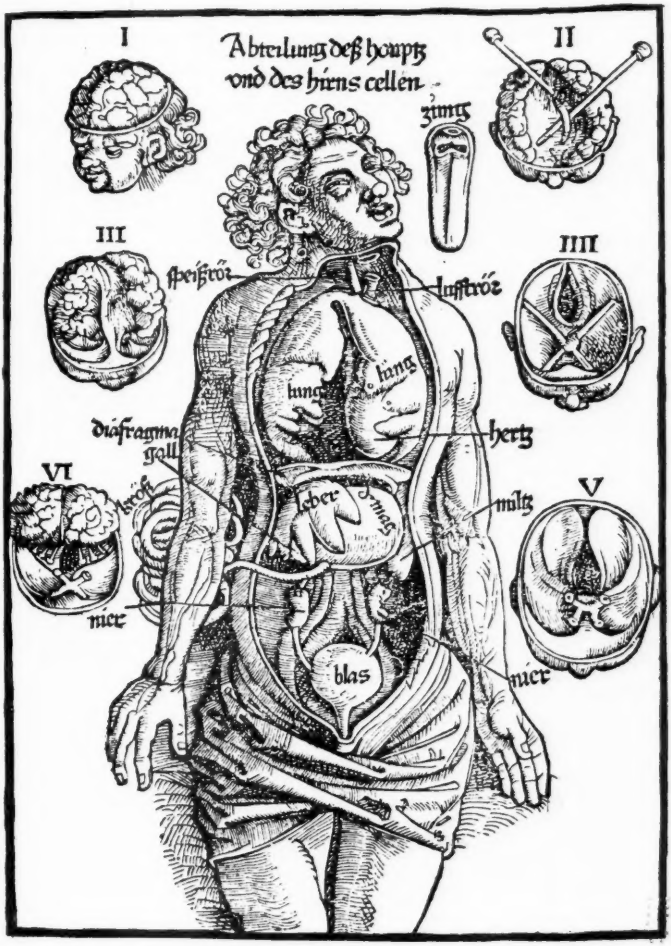
Nevertheless, the barren period was a short one ; even at the time of Leonardo's death the boy Vesalius was five years old. His was to prove the master-mind for which was reserved the study of human anatomy based upon direct observation. To turn to the pages of the *De Corporis Humani Fabrica* of Vesalius is to step from the confusing glimmer of conjecture and tradition into clear light and order. From the first this great teacher availed himself of the assistance of the painter and engraver. He not only selected artists of the highest capacity, but himself

superintended and directed all their interpretations. To realise how far he out-distanced his predecessors we may compare a plate from the anatomy of Phries (1518) with one from Vesalius (1543). (Plate III. & IV.) It is hard to say whether the text or the illustrations exercised the stronger influence over the contemporaries and followers of Vesalius, but the very number of his imitators serves to prove the greatness of this influence. Apart from the internal evidence which Vesalius' magnificent work on anatomy provided there would be little else to show that his interest in anatomy extended to the æsthetic arts, were it not for one other fact, namely, he numbered among his friends Titian, who "for the pictorial representation of nature surpassed all other great painters of Italy."

One of Titian's pupils, Johan Stephan von Calcar, executed the plates which illustrate Vesalius' anatomy. Calcar painted the portrait of Vesalius which is one of the treasures of the Royal College of Physicians in London.[1]

Thus the fashion arose of employing admirable designers to illustrate works on anatomy. But a clear distinction must be made between the use of the æsthetic arts for purposes of illustration and record and the value of artistic powers of perception to the individual scientific observer. The application of art to illustrate medicine can only preserve and represent what is known, it does not discover the unknown. The art of medicine gained relatively little from the addition of artistic illustrations to the printed books. We see this exemplified in the numerous anatomical plates which came into vogue after Vesalius had shown what was possible. In his plates the illustration is secondary to the

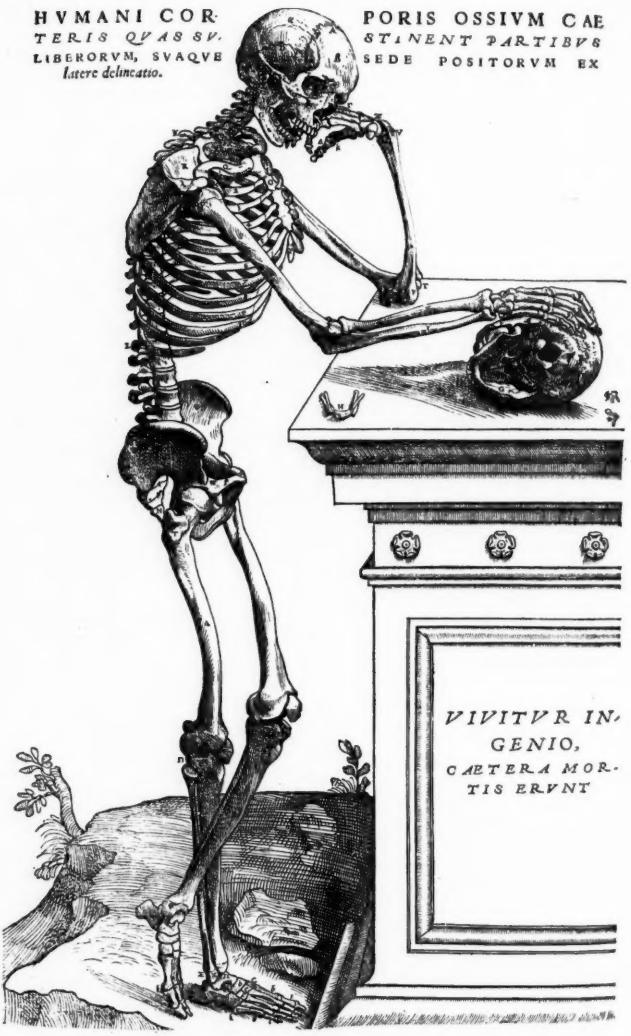
[1] There is a folio volume entitled *Notomie di Titiano*, containing seventeen plates engraved by Bonavera. These plates are identical with Caspar's illustrations to Vesalius, except for being reversed. The title-page includes a head and neck of Titian copied from Caspar's portrait. I have failed to discover why Bonavera ascribed these seventeen plates to Titian. (Plate V.)



LAURENTIUS PHRIES, OR FRIES, *circa* 1500.

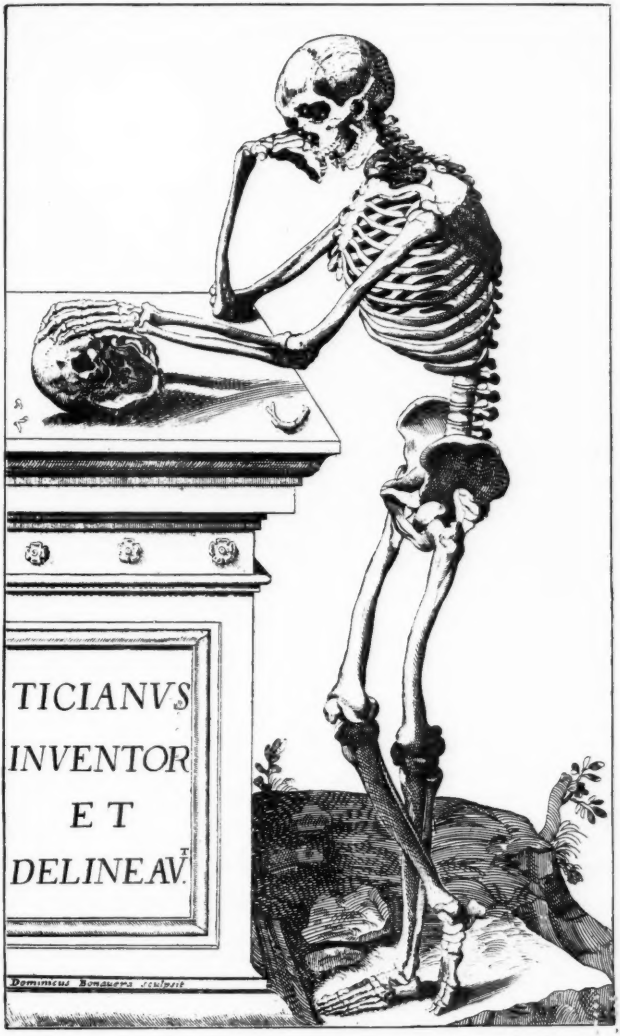
From the *Spiegel der Artzney*, Strasburg, 1518.

PLATE IV.



VESALIUS,
1514–1564.

From the *De Corporis Humani Fabrica*, Basle, 1543.
Woodcuts by Caspar



[TITIAN ?]
1477–1576.

From the *Notomie di Titiano*. 17 Plates engraved by Domenicus Bonavera. (No text, no publisher, no place, no date.)

PLATE VI

CHARLES ESTIENNE (CAROLUS STEPHANUS), 1503–1564.

From the *De Dissectione Partium Corporis*, Paris, 1545.

subject of the text, at the hands of his successors the anatomy becomes little more than the vehicle for the fanciful designs of the draughtsman. (Plate VI.) As artistic compositions the illustrations are striking, but the anatomy is grotesque. Even Bidloo's plates did not add largely to science ; he composed some bad text for the highly-praised plates of the artist Gérard de Lairesse. (Plate VII.)

As time went on the printing press and its ancillary process of mechanically reproduced illustrations made great strides towards perfection, so that good illustrations eventually became a matter of course. Yet the onward progress of medicine was fitful. It seems as though important discoveries were only possible when the exceptional man appeared in whom the artistic sense was united with the scientific spirit. All primary discoverers are artists in the sciences they work in.

Such was William Harvey, who in 1628 published his immortal treatise on the circulation of the blood. The printed book owed nothing to the indifferent copper plates that illustrated it. What was it that this round-faced, olivaster-complexioned man possessed which enabled his eye, " very black and full of spirit," to see far more clearly than his fellows ? Harvey's genius lay in his inimitable powers of artistic perception, not used for creative art or for mere illustration, but applied rather to accurate observation. To those powers he added imagination wherewith to frame hypotheses, and patient judgment to test his hypotheses by investigation and experiment, whilst we know from the records of his life that he was likewise a keen student and critic of the fine arts. When he went on his diplomatic journey with the Earl of Arundel through Europe a member of the Embassy wrote a letter speaking of " honest little Harvey whom the Earl is sending to Italy about some pictures for his Majesty." I wonder what those pictures

were? "His Majesty" was King Charles I., who brought the Leonardo MS. on anatomy to the Royal Library now in Windsor. Nothing more is known of how it came into the King's possession. The present librarian has courteously given me this information. Can Harvey have secured it, with the "pictures for His Majesty"?

More than once in his writings the artist's mind shows itself in the man of science. In his *De Generatione* Harvey compares the artist and the scientist:—

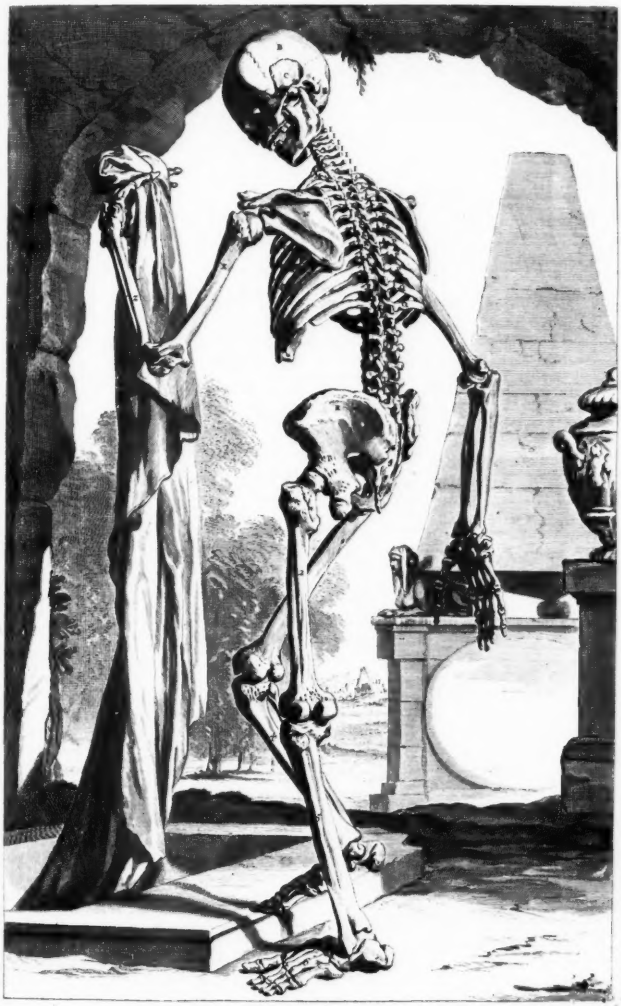
"The things that have formerly been noted, and that by use or wont have become firmly fixed in the mind of the artist, do, in fact, constitute art and the artistic faculty: art indeed is the reason of the work in the mind of the artist.

"On the same terms, therefore, as art is attained to is all knowledge and science acquired; for as art is a habit with reference to things to be done, so is science a habit in respect of things to be known. Each has its origin in sense and experience, and it is impossible that there can rightly be either art or science without visible instance or example."

Harvey lived to a good old age, and died in 1657 in his 80th year. Thomas Willis was then 35 years old. He was one of the little group of savants to whom we owe the foundation of the Royal Society. Willis followed the example of Vesalius, and sought the help of one of the greatest draughtsmen of his time, Christopher Wren, to illustrate his anatomy of the brain. (Plate VIII.)

Wren, however, was no mere illustrator of anatomical treatises. During his residence at Oxford he pursued his scientific studies, and in anatomical science he stood among the first professors of the day. He acted as anatomical demonstrator at the lectures and dissections of Scarborough and Willis.

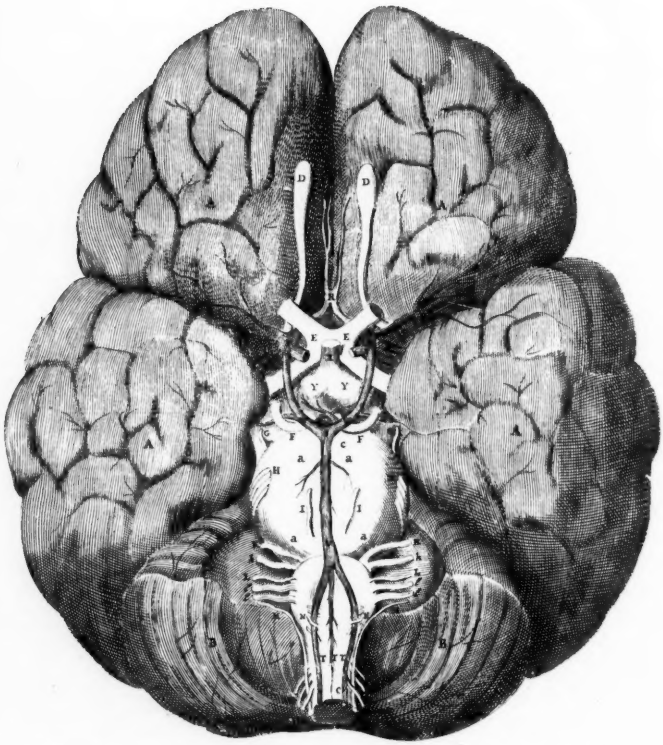
Moreover, Wren was the author or discoverer of the



GODOFRIDUS BIDLOO,
1649-1713.

From the *Anatomia Humani Corporis*, Amsterdam, 1685.
Plates by Gérard de Lairesse.

PLATE VIII.



THOMAS WILLIS,
1622–1675.

From the *Cerebri Anatome*.
Plates by Sir Christopher Wren.

anatomical experiment of intravenous injection. He injected wine and ale into dogs' veins and made them drunk; he also experimented with opium, scammony and other drugs, showing that they exerted their proper effects when thus injected. These experiments he hoped might bring great light to the theory and practice of physic. Among his anatomical works are to be found descriptions of the bones of the arms, dissection of the eel and experimental splenectomy in the dog. If the rebuilding of London after the Fire of 1666 had not brought him greater fame, we might still have held him in high honour for his anatomical and physiological researches, nor have forgotten that when Glisson, Wharton and Hodges stayed out the Plague in London Wren faced it with them. In February, 1923, we shall celebrate the 200th anniversary of Wren's death, and I trust that the medical profession will pay fitting tribute to a worthy exemplar.

Medicine in the eighteenth century was remarkable chiefly for the rise of innumerable systems and sects. Philosophy and metaphysics were the vogue; scientific observation such as Harvey knew was less fashionable.

In the midst of a welter of Eclecticism, Animism, Vitalism, Mechanico-dynamism, Hoffmanism, Magnetism, Realism, and Brunonianism there came a modest Viennese physician, " a great friend of music and the arts in general."

Auenbrugger was born on Nov. 19th, 1722, just 200 years ago. He made the simple observation " that the chest of a healthy man resounds when struck." " I lay before you, benevolent reader," he says, " a new sign for the elucidation of diseases of the chest. . . . This consists in the percussion of the human thorax, by the varying resonance of whose tones a judgment may be formed as to the internal condition of this part."

Recollect that prior to this announcement only one

physical sign of any thoracic disease had been described, nothing had been added to the "succussion splash" of Hippocrates. Auenbrugger's brilliant suggestion laid the foundation for our whole method of physical examination of the chest.

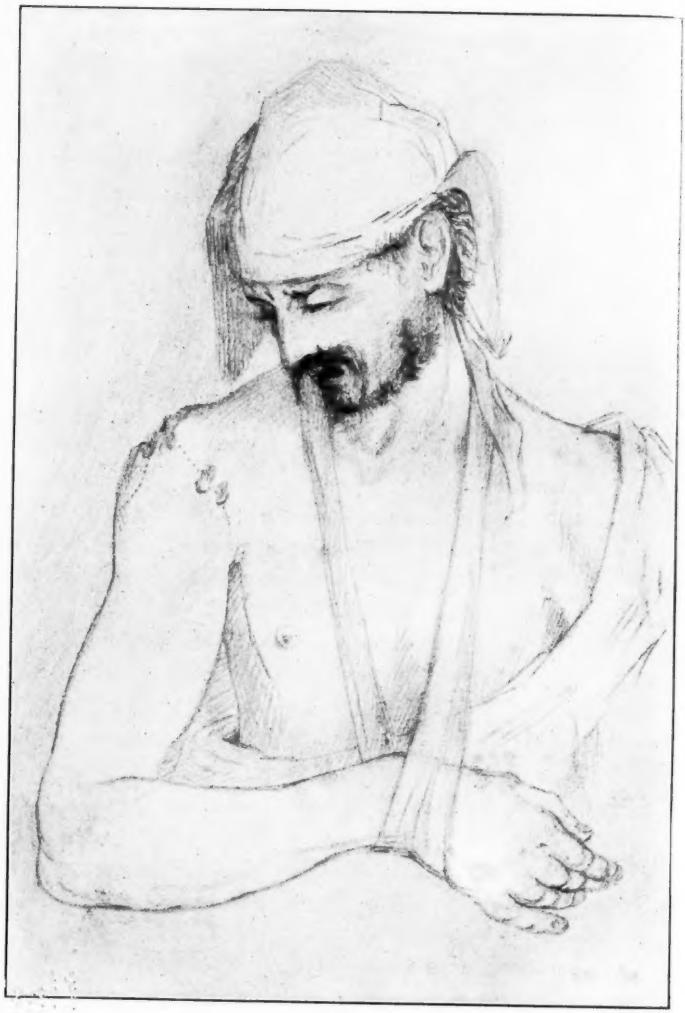
It is singular to note how little medicine owes to the "systems" which men have invented for its study and practice, how much it owes to apparently disconnected observations. Philosophy and metaphysics have added nothing to our knowledge and understanding of medicine.

Auenbrugger in his spare moments dabbled in music, he even composed an opera (*The Chimney-sweeps*), which was performed, without marked success. I am not sure that it has survived to the present day. But his love and understanding of music enabled him to discover the art of percussion, and have given to posterity more lasting benefits than all the operas of past and present times.

In England the eighteenth century produced men endowed with similar faculties, notably the two brothers William and John Hunter, both of whom displayed the keenest appreciation of the arts. William was the first professor of anatomy to the Royal Academy, and published a treatise on the "Gravid Uterus," upon the plates of which the foremost engravers of the day were employed. John Hunter, whom as an anatomist men have put equal with Vesalius, had a large share of his love of art. In his collection were to be found pictures by Teniers, Ostade and Vandevelde. His friendship with Sir Joshua Reynolds is well known, and gave us the magnificent portrait of Hunter that Sir Joshua painted.

In the series of letters that John Hunter wrote to Jenner there are many references to the purchase of pictures, for these two friends were not only united by their common interest in natural history, their love of artistic things was

PLATE IX.



SIR CHARLES BELL,
1774–1842.

A soldier wounded at Waterloo.
(Pencil drawing in possession of the
Bristol Medico-Chirurgical Society.)

a further bond. In 1776 or 1777 Hunter writes to Jenner: "I must pick you up a picture this winter." And again: "Pictures have been very cheap, but the season is now over. There will be but one sale, viz., Fordyce's; but I believe all his pictures are exquisite and will go beyond you or me."

Jenner himself, the incomparable country doctor, is the aptest figure of all to illustrate my theme. Was it not his artist-eye that, falling upon the unscarred faces of the Gloucestershire dairy-maids, discovered that they owed the preservation of their good looks to the cow pox? Baron's life describes how "he had the keenest relish for picturesque beauty, and in his excursions alike gratified his taste in this respect and increased his knowledge by pursuing the details of natural history"; and elsewhere says, "Those who have accompanied him for 20 or 30 miles in a morning listened while with a vivid and imaginative fervour he shadowed forth his own feelings or with a painter's eye and poet's tongue delineated the beauties around him."

Such a man, too, was Sir Charles Bell (born 1774), who took charge of a hospital in Brussels after the Battle of Waterloo, and made the pencil sketch of a wounded soldier which our Society so jealously prizes. (Plate IX.)

In 1816 he published his momentous discovery that the posterior roots of the spinal nerves carry the sensory fibres and the anterior roots the motor, a discovery as important to the knowledge of the nervous system as Harvey's to the circulatory. Bell wrote in 1821 of his discovery, "I know this will put me beside Harvey." Even without this epoch-making observation his studies on the anatomy of expression would have entitled him to a high place among the great scientists who were artists.

This year marks the centenary of the birth of another master-artist in science. Pasteur was born in 1822. At

school he was a merely average pupil. He showed a rather marked taste for drawing. A few successful efforts in chalks and in charcoal seemed to foretell for him an artistic career.

Fortunately for science, and medicine in particular, Pasteur found in the study of nature more complete play for his æsthetic and artistic sensibilities than in continuing along the paths of creative art. It was the study of crystals and the science of crystallography that first attracted him into natural science. To him perhaps Paget's remarks in his Hunterian address apply, "I cannot doubt that in the contemplation of the order and mutual fitness in the great field of scientific truth there may be, to some high intellects, a source of pure delight such as are the sensuous beauties of nature to the cultivated artist-mind."

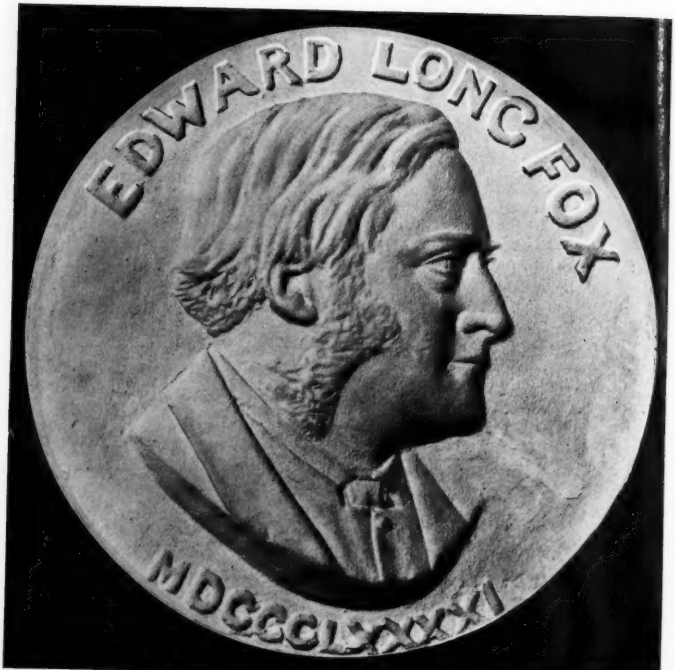
Although Sir James Paget was speaking of John Hunter, there can be little doubt that he was expressing sentiments which he had experienced to the full. Paget, like Pasteur, had shown considerable talent for drawing at an early age, throughout life he was no mean judge of music and painting, like John Hunter he made some of his closest friends amongst artists. I have found in the *Memoirs and Letters* of Sir James Paget his own estimate of the value of the fine arts:—

"In close connection with the study of natural history was that of some small measure of the fine arts. My father was a friend and patron of Old Crome. . . . Pictures, engravings, drawings were everywhere in the house: and art and artists were talked of, and Young Crome succeeded Old Crome in his weekly visits at the house, and nearly all of us had lessons from him." He goes on to say that the immediate utility of this meagre education in painting and drawing was little, but "its indirect utility was too great to be told. It helped to enable me to look and see more in

SIR JAMES PAGET,
1814–1899.

Woolsey's Mill, near Yarmouth.
(From a pencil sketch by Paget during Apprenticeship.)
Block lent by Messrs Longmans, Green & Co.

PLATE XI.



J. GREIG SMITH,
1854—1897.

Medallion of Dr. E. Long Fox.
(In the possession of Mrs. P. Watson-Williams.)

things than some could see: it strengthened the power of remembering things seen." (Plate X.)

Innumerable additions might be made to the instances I have quoted. There is Graves, whom Trousseau described as "a perfect clinical teacher, observer, philosopher, ingenious artist"; and Addison, who superintended the making of the wax models in the museum of Guy's Hospital. In our own city Greig Smith, one of the founders of abdominal surgery, was no mean modeller in clay, as his medallion portrait of Dr. Long Fox testifies. (Plate XI.)

But amongst all the moderns Charcot must surely stand first. The unrivalled method of studying nervous diseases which he instituted at the Salpêtrière was the outcome of an artistic genius closely akin to that which inspired the Greeks. Henri Meige, writing of him in 1898, speaks of "the artist who, in Charcot, went hand in hand with the physician, so that under his influence an artistic spirit came into being at the Salpêtrière which reflected an unwonted lustre on medical science."

To conclude, what is the upshot of these reflections on the importance of the artistic sense to scientific progress as a whole and to the science of medicine in particular?

Galton in his enquiry into the power of mental imagery came to the conclusion that scientific men as a whole did not see with the mind's eye. He found scattered instances amongst men of science, though by no means in the same abundance as amongst the generality of people untrained to science. In youth the proportion who exhibit this faculty is high, but the study of languages and book-learning tends to dull it. The delight of recalling beautiful scenery and great works of art is one of the highest pleasures. Those who possess the power carry whole picture galleries with them. Moreover, this ability to recall by mental visualisation

transcends far the possession of carefully registered notes on the shelves of a well-stocked library.

Unfortunately, a habit of suppressing mental imagery seems to characterise men who deal with abstract ideas, and men of abstract ideas are often looked upon as likely pioneers in science. So that this faculty, which is so important in all technical and artistic occupations, that gives accuracy to our perceptions and justness to our generalisations, runs a risk of being suppressed by our bookish and wordy education, and of being deliberately starved by the lazy disuse of philosophers.

Children, as Galton discovered, have far stronger powers of visual representation than scientific men as a class. The basis of accurate mental imagery lies in keen and rapid perception by the senses. Memorising by rote and from the printed page, or worse still by some jingle of words, is a poor substitute for recollection by means of artistic receptivity, which seems to be nature's endowment of nearly every child. The student of medicine cannot afford to allow this gift to be deliberately starved by philosophical neglect or belittled by the contempt of pedants, for it seems to me that one of the chief factors which has transformed the healing art from mere magic into scientific medicine has been the happy conjunction of the artist and the scientist in the same individual.

That one man should combine these two faculties developed to a high level is uncommon. When such a singular genius arises he seems to move in an orbit of his own, he seems not to belong to the period of the world's history in which he lives.

His discoveries are scarcely influenced by the age in which they are made. Lapse of years cannot impair their freshness. What historian of philosophical method could assign to their proper date on internal evidence Harvey's

discovery of the circulation of the blood, or Bell's discovery of the motor and sensory nerve roots?

A certain inevitable progress in knowledge can be made by those drudges who can dig with labour and patience even though they have not wings to fly. They can follow the road and reach new milestones, but they are always tied to the road. "Art," as John Brown phrased it, "can go across country."

It is, I believe, the artistic sense that raises the scientist above the drudge and furnishes him with wings to fly.

THE PRINCIPLES OF SURGICAL TREATMENT OF INFECTIONS OF THE PERITONEUM.[1]

BY

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TWENTY or thirty years ago, when abdominal operations of all kinds were of far less frequent occurrence than at the present time, peritoneal infection was looked on with grave anxiety by the surgeon, and the most strenuous efforts were made to limit by surgical measures the spread of inflammation, which it was felt Nature herself could do little to control.

For example, a case of acute appendicitis with peritonitis diffusing from the right iliac fossa, after removal of the appendix, was treated by thoroughly washing the inflamed peritoneum either with dilute antiseptics or with saline solution. Many surgeons went further and irrigated the

[1] *Opening Remarks at a Discussion at a Meeting of the Bristol Medico-Chirurgical Society, November 8th, 1922.*

whole peritoneal cavity with saline, even eviscerating the coils of intestine in order to cleanse them more effectively. Efforts were then made to allow of the escape of serous or purulent effusion by means of tubes inserted, not only in the neighbourhood of the appendix, but in the pelvis, in the loins and any other situations where the surgeon's experience led him to fear the accumulation of septic material.

As soon as possible after the patient recovered from the anæsthetic, and in fear of the onset of paralytic distension of the intestines, which might lead to fatal obstruction, calomel was administered, either in a few large doses or in frequent small ones. This was followed up by saline purgatives and by copious and repeated enemata.

To administer morphia in such a case was looked on as little less than a crime, and, indeed, the minds of surgeons were so imbued with the dangers of morphia in all abdominal operations that this drug was almost universally banned in abdominal surgery.

The practice of those days in the treatment of peritonitis may be shortly described as :—

1. Removal, when possible, of the main source of sepsis.
2. Cleansing of the peritoneal cavity by washing.
3. Drainage of the peritoneal cavity by tubes or other mechanical means.
4. Administration of purgative medicines.
5. Stern abstinence from morphia.

This practice was evidently based on the beliefs :—

1. That the peritoneum is vulnerable to infection and has little power of resisting and controlling it.
2. That intestines whose peritoneal coat is inflamed tend to become paralysed and, unless stimulated by artificial means, to pass into a condition of acute obstruction.

In other words, the treatment of five-and-twenty years ago was based on *profound distrust of the peritoneum.*

Doubts of the truth of the principles of that time and of the practice resulting therefrom began to assail my mind many years ago, and little by little those doubts have strengthened into a settled conviction, shared by many surgeons, that with the one exception of removal, when possible, of the main source of sepsis, treatment of peritonitis as carried out at that time was based on faulty reasoning and should be entirely altered.

My views have changed so completely that I am prepared to maintain the following propositions :—

1. That the peritoneum should never, or hardly ever, be washed.

2. That it should only seldom be drained.

3. That in peritonitis purgatives should never be administered.

4. That in peritonitis morphia should always be given.

It is therefore necessary to examine in detail the questions of *Washing, Draining* and *Purging.*

Lavage of the Peritoneum.

To inquire into the value of peritoneal lavage, it is necessary briefly to recall the nature of the protective mechanism of the peritoneum.

The latter is a large and complex space lined over its whole surface by a layer of endothelium whose continuity is interrupted only at the fimbriated orifices of the Fallopian tubes.

The importance of this endothelial lining has been aptly compared by Dudgeon and Sargent to that of the skin of the hand. While the skin is intact the hand may be plunged with comparative impunity into infective solutions of extreme virulence, but in the presence of the smallest abrasion grave infection is likely to ensue. Similarly, so long as the

endothelial cells retain their vitality and continuity the peritoneum can deal with and control infection, but when a breach is produced by mechanical, chemical or bacterial agency a direct route is at once opened for the passage of the infecting agent into the blood-stream through the subendothelial vessels.

When pathogenic bacteria gain access to the peritoneal cavity two effects are produced :—

1. There is a rapid and copious pouring out of serous effusion containing phagocytic cells. With extraordinary rapidity the latter ingest invading bacteria and appear with them in the subendothelial lymph spaces on the surface of the diaphragm. The object of this protective effusion, therefore, is first to destroy the infecting agent, and then to carry it away from the peritoneal cavity.

2. The formation of a fine layer of fibrin over the intestinal surfaces. This layer is familiar to surgeons at operations in the form of plaques and masses of plastic lymph, but according to the researches of Dudgeon and Sargent it is everywhere present, and can be demonstrated by the microscope when it is too fine to be visible to the naked eye. The objects of this fibrinous layer are to protect the endothelium from the action of toxins, to enable the intestinal surfaces to adhere together in order mechanically to limit the spread of infection, and to provide fine strands or ladders along which phagocytes may travel on their way to the scene of action.

This, then, is the mechanism set to work by Nature to combat infections introduced into the peritoneal cavity.

When the latter is irrigated with saline solution the protective effusion, with its army of phagocytes, is washed away and the peritoneum is left bare of defence.

Were it possible completely to wash away the infection also this might be a justifiable proceeding, but it is altogether

beyond the power of the most prolonged and thorough irrigation to cleanse and render sterile a cavity so large and complex and so full of nooks and crannies as that of the peritoneum.

In the second place, the peritoneum cannot be efficiently washed without introducing the irrigating tube, and probably also the hand, into every part of the abdomen ; and in this way not only will the endothelium inevitably be damaged, but the protective layer of fibrin will be disturbed and torn away, carrying further patches of endothelium with it and laying bare the vulnerable subendothelial tissue.

It is almost unnecessary to mention the added risk of carrying infection to areas hitherto unaffected.

It appears, therefore, that the more efficiently lavage is carried out the greater must be the harm that is done.

The undesirability of lavage as a routine measure in the treatment of ordinary cases of peritonitis is now recognised almost universally, and few surgeons at the present day would wash out the abdomen in generalising peritonitis from appendicitis, gangrenous gall-bladder, or perforation of a malignant growth of the colon. Nevertheless, in the treatment of perforated gastric and duodenal ulcers lavage is still not uncommonly practised, and it cannot be denied that in these cases good results are obtained under this method of treatment.

When we consider the disastrous results which attended lavage when it was extensively used in the more virulent infections, and the vastly improved mortality since its practice was discontinued, for these reasons, as well as on *a priori* pathological grounds, it must be concluded that in perforated gastric and duodenal ulcers lavage is unnecessary, that patients recover *in spite of* lavage and not by its aid, and that in these comparatively mild infections, as well as

in the more virulent type, this method of treatment is best dispensed with.

While the peritoneal effusion is in the first place a powerful instrument of protection which should not be interfered with, it is obvious that in severe infections a point may be reached when the phagocytes have all been destroyed, and when the effusion has lost its protective properties and has itself become septic.

Recently a plea has been brought forward [1] for the use of lavage in the worst type of cases, when the patient appears to be overwhelmed with toxæmia. Willis records cases of severe infection in which he believes recovery to have been due to the use of saline irrigation with the definite object of getting rid of a mass of toxic fluid.

Whether equally good results might have been obtained by the mere removal of the effusion by soaking it up with gauze is a question which may justifiably be asked, in view of the disastrous effects of lavage in a large series of cases of septic peritonitis in which it was used at St. Thomas's Hospital some twenty years ago.

Drainage of the Peritoneal Cavity.

While peritoneal lavage has to a great extent been discarded, the use of peritoneal drainage still commands the confidence of so many surgeons, that to venture to express doubts of the efficacy of the drainage-tube in the treatment of peritonitis may well lay one open to the charge of dangerous surgical heresy. Nevertheless, it is necessary to inquire into the value or otherwise of this time-honoured practice.

To call to mind, once more, the reaction of serous membranes, including the peritoneum, when an irritant, infective, chemical or mechanical (such as a drainage-tube), is introduced into their interior—first an effusion, believed to be

[1] Willis, *Surg., Gynec. and Obst.*, 1921, xxxiii. 355.

protective, is poured out, and, second, around the site of irritation there takes place a rapid and profuse exudation of plastic lymph.

When a drainage-tube is inserted into the peritoneal cavity its first effect is to drain off some of the fluid—probably protective in its nature—from the neighbourhood of the tube. But this drainage, such as it is, can last only for a very short time, because within a few hours the tube will be completely encased in a layer of plastic lymph which completely shuts it off from the rest of the peritoneal cavity.

In order to verify this statement it is only necessary to open the abdomen of any patient who has died of septic peritonitis, the peritoneum having previously been drained. The tube will be found to be completely enclosed in plastic lymph, and to be draining, *not* the peritoneal cavity, but a localised abscess-cavity which surrounds it.

It therefore appears that an abscess-cavity has actually been brought about by the insertion of the drainage-tube, and that the surgeon, having carefully removed one source of infection, has been at pains to produce a second, only less dangerous because it communicates at one end with the surface of the body.

It may be argued that in the later stages of severe infection previously referred to, when the effusion has itself become a danger, the temporary escape allowed by the tube may be of great service to the patient, and may enable him to "turn the corner." This may be so, but in my opinion and experience the same result may equally be obtained by removal of the septic effusion at the time of operation by gently expressing it and soaking it up with gauze, so as to leave the peritoneum comparatively dry; by this means at least the formation of a secondary focus of infection, inevitable in the presence of a drainage-tube, may be avoided.

It must freely be acknowledged that excellent results are daily obtained in the treatment of peritonitis by peritoneal drainage. That drainage-tubes in the peritoneal cavity may do good in some way as yet unexplained is possible. They certainly do not act by draining the peritoneum.

Deliberate production of localised suppuration by means of a seton is an ancient practice, and the newer method of the fixation-abscess is said to be much in vogue at the present time amongst French physicians.

What may be the exact *modus operandi* of the seton and the fixation-abscess is scarcely a matter even of speculation for the mere surgeon. The action of the drainage-tube in the peritoneal cavity appears to be equally mysterious.

One of the most remarkable facts forced on operators who dealt extensively with the grossly infected wounds of the Great War was the extraordinary and unique power of serous membranes to withstand and control infection, provided the grosser sources of sepsis were removed—and subsequently the structures were given the opportunity of rest, and were not subjected to the irritation of foreign bodies, such as drainage-tubes.

The history of the knee-joint is well known—how in the early days, with touching faith in surgical tradition, we drained them with tubes and the limbs came off, till with increasing experience towards the end of the war it was universally looked on as a surgical crime to put a drainage-tube into a synovial cavity.

Experience of abdominal wounds was similar; peritoneal cavities grossly soiled by fæces from punctured and lacerated bowels were found to do better if gently cleansed and closed without drainage.

In the treatment of abdominal wounds the tissue that required drainage was not the peritoneum, but the abdominal wall, and particularly the retro-peritoneal tissue.

Excluding early deaths from shock and hemorrhage, the major part of the mortality after operation resulted, not from peritonitis, but from spreading sepsis in the abdominal wall; and it was clearly shown that while the peritoneum itself has a wonderfully efficient protective mechanism, the retroperitoneal tissue and the intermuscular fascial planes are vulnerable structures which have little power of resistance. Therefore in dealing with septic peritonitis the abdominal wall should always be drained down to the peritoneum, but the peritoneal cavity itself should in general be closed without drainage.

Certain conditions, however, form exceptions to this rule, and in these the introduction of a drain into the peritoneum for a short time appears to be the correct procedure—

1. When there is free oozing at the site of operation which cannot be completely stopped. As a collection of blood-clot is obviously undesirable in the presence of infection a drain should be left in for 24–36 hours.

2. When it is expected that a viscus may discharge its contents at the site of operation; *e.g.* the ligature may cut through the softened cystic duct after removing a gangrenous gall-bladder, and bile may be discharged. A drain at the point of expected leakage is an obvious safeguard.

3. When there is present in the peritoneal cavity a localised abscess-cavity with organised walls which must discharge piecemeal over a period of time a drain must be left in. This is not strictly drainage of the peritoneum, but of an abscess-cavity which is really extra-peritoneal.

4. When on account of the patient's condition or for any other reason the primary focus of infection is not removed a drain must be inserted in its neighbourhood.

Purgation.

Of all the principles of surgery the greatest and the most universally applicable is that of *Rest to Inflamed Parts*. It is an interesting speculation to inquire why was it for so long the rule for surgeons to deny to the peritoneum that rest which it has been our aim to secure for all other structures when the seat of inflammation.

All aperients act as irritant poisons to the intestinal mucosa. They have been shown to increase the number and virulence of intestinal bacteria. By irritating the walls of the gut they tend to increase their penetration by germs, and by producing violent peristaltic contractions they disturb the protective layer of fibrin covering their peritoneal surfaces.

The dangers of giving aperients before operation have again and again been pointed out by Moynihan, who has convinced us that a mild septic focus may be transformed by their action into a fulminating lesion.

If dangerous before operation, why less so afterwards? It is true that the grosser source of sepsis is no longer present, but it is unlikely that the whole of the infection has been eliminated. Foci of sepsis in any acute case still remain, and in order that the protective forces of Nature may be given their fullest scope it is necessary that the peritoneum and intestines be kept at rest.

Two methods are at our disposal for giving rest to these organs :—

1. Abstinence from food.
2. Morphia.

The question of dietary after operation for peritonitis, as well as those of salines, the administration of glucose and alkalies, and of the Fowler position, is beyond the scope of these remarks, which will conclude with discussion of the use of morphia.

We have been told that morphia is dangerous, first because it increases the shock of operation, and also because it tends to produce paralytic ileus and intestinal obstruction.

With regard to shock, it is only necessary to say that the experience of years shows that morphia does not produce shock after operations of any kind when given in reasonably moderate doses, and further that Crile has proved that it is the one drug which has the power of diminishing shock.

With reference to paralytic ileus, one must again make a personal statement. For many years every patient after abdominal operation in my practice has had sufficient morphia to keep him in reasonable comfort when he needed it, and every case of peritonitis has had morphia as a routine for the first two or three days as part of his treatment, and whether he required it for pain or not.

While an ordinary incidence of flatulent distension occurs, easily relieved by flatus tube or by enema and pituitrin, the severe forms of paralytic ileus are practically unknown ; no case of ileus duplex has been seen.

In my earlier experience severe paralytic ileus was more common, before I habitually used morphia and while aperients were yet being given. Aperients, such as calomel, given while the bowels are inflamed actually tend to bring on the worst forms of intestinal distension, with the object of preventing which they were administered.

It will be noticed that pituitrin has been mentioned as being used for flatulence, and in clean operation cases it is of course a most valuable drug. But in cases of peritonitis I prefer to withhold even pituitrin for the first forty-eight hours if possible, and to keep the intestines absolutely at rest. For the same reason aperients are entirely forbidden till the first week has passed, though liquid paraffin is usually given twice a day after the first two or three days.

Earlier in these remarks it was pointed out that the treatment of peritonitis five-and-twenty years ago appeared to be based on *distrust* of the peritoneum and intestines, and of their capacity to take care of themselves after an operation for removal of the septic focus responsible for the onset of peritonitis.

The practice advocated now is based firstly on *profound faith* in the power of the peritoneum to resist and control infection, provided the main source of sepsis be removed and its mechanism be not interfered with by ungentle handling, by washing, by unnecessary drainage-tubes or other foreign bodies, or by the administration of irritant poisons in the form of aperients; secondly, on realisation of the truth and value of the great principle of *Rest to Inflamed Structures*, as set forth by John Hilton sixty years ago.

In conclusion, a few short extracts from his immortal lectures on *Rest and Pain*—perhaps the greatest classic of surgical therapeutics ever given to the world—require no apology for their quotation:—

"It would be well, I think, if the surgeon would fix upon his memory, as the first professional thought which should accompany him in the course of his daily occupation, this physiological truth—that Nature has a constant tendency to repair the injuries to which her structures have been subjected, whether those injuries be the result of fatigue or exhaustion, of inflammation or accident.

"Also that this recuperative power becomes at once most conspicuous when the disturbing cause has been removed . . ."

"That if the local disturbing cause, whatever it be, is removed, Nature has an immediate tendency to repair the injury which has been inflicted, because she is able to adopt her own remedy, Rest . . ."

"Nearly all our best considered operations are done for the purpose of making it possible to keep the structures at rest, or freeing Nature from the disturbing cause which was exhausting her powers, or making her repeated attempts at repair unavailing.

"So in all operations for hernia, the object is to give the intestine rest and freedom from pressure, both immediately after and for a long time subsequent to the operation. Most of us now act on this principle. We take care not only not to disturb the intestine by purgatives, but we give opium to arrest peristaltic action. We know the gut has been damaged in its function and structure and will not bear excitement; that it requires rest and quiet to enable it to repair itself."

ACQUIRED RESISTANCE TO TUBERCULOSIS: A FACTOR IN CLINICAL TYPE AND PROGNOSIS.[1]

BY

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IT is appropriate, here in Bristol, the city of William Budd, to address a medical audience on the subject of tuberculosis, a disease for ever associated with his name.

If the responsibilities of a large practice and the study of typhoid fever and other diseases closed for William Budd the paths of experimental investigation and research that were so successfully followed by his great French contemporary, Villemin, these preoccupations were powerless to confine the independent play of thought, the informed and

[1] *Address delivered to the Bristol Medico-Chirurgical Society, Dec. 13th, 1922.*

original speculation that led this great Englishman to the same conclusions which Villemin by experiment demonstrated to be true. He writes as follows in 1867 :—

" The idea that phthisis is a self-propagated zymotic disease, and that all the leading phenomena of its distribution may be explained by supposing that it is disseminated through society by specific germs contained in the tuberculous matter cast off by persons already suffering from the disease, first came into my mind, unbidden, so to speak, while I was walking on the Observatory Hill at Clifton, in the second week of August, 1856."

Tuberculosis an infective disease ; there was the truth that had flashed into the mind of Budd. It may seem a truism to-day, but we must remember that Budd spoke before Villemin had proved that tuberculous material could reproduce the disease in animals and before Robert Koch had isolated the tubercle bacillus. Against the theory of infection was the constantly observed fact that persons might be closely associated with a tuberculous patient for long years without ever developing the disease. At that time there was no Von Pirquet reaction to show that infection may exist without illness ; there were no records such as those of Naegeli, of Bughart, or of Hamburger to prove that a large percentage of cadavers show evidence of old and obliterated tuberculous infection.

When we take into account the state of knowledge on this subject in 1856, we are able to realise the wonderful vision that led William Budd with unerring perception straight to the truth.

What was the line of thought that led him ? It was the consideration of the phenomena of the disease when introduced into isolated communities such as the population of certain islands in the Pacific, previously free from all contact with infection. Budd realised that only under these

circumstances could the disease manifest clearly its infectious characters, because here the people were " virgin soil " to the infective agent. He realised, then, though perhaps without expressing it even to himself, that contact with infection may lead to resistance, and that in the civilised and urbanised communities of this country the spread of infection is masked by another and an allied factor, the acquisition of resistance.

If we glance into the wards of an isolation hospital where cases of typhoid fever are being treated we can say with confidence that of those present, now lying too ill to read or talk, all will have left the institution in a month or two; from 15 to 20 per cent. may perhaps be dead, the rest clinically well, but with one or two in every hundred doomed to become " typhoid carriers " for the rest of their natural lives.

But if we look, instead, into a ward full of advanced cases of pulmonary tuberculosis we are led to make a very different forecast. In a month or so nearly all those present to-day will still be present, still propped up in bed knitting or reading the papers, still hopeful that their health will soon be restored. It will be a year before 15 or 20 per cent. are dead, but nearly all of them will be dead five years hence. And those who recover sufficiently to leave the hospital during the interval will all be " tubercle carriers," excreting the germs, not only in urine or fæces where its safe disposal is the rule, but also into the circumambient air that must be breathed by their fellow-creatures.

This contrast, though obvious, is important. It marks out tuberculosis as a disease with few parallels in human pathology, as a disease infection which must be almost universal under conditions of close human contact, as something to which civilised man must adapt himself or perish.

In the case of most of the bacterial diseases of man the

issue is not long in doubt. The bacterial invasion is either arrested and overcome, with recovery of the patient, or else prevails so completely as to lead to a fatal result. There is little or no tendency to a delicate and protracted state of balance between the invasive powers of the germ and the defensive powers of the body.

For those pathological conditions in which such a state of " balance " is common I desire to use the expression " competitive symbiosis " to describe the relations of the parasite to the host.

There are certain protozoal and spirochætal parasites which have the power of settling down in " competitive symbiosis " with their vertebrate hosts. Amongst bacterial parasites, however, it is only the tubercle bacillus and the closely allied germs of leprosy, glanders, actinomycosis and a few other streptothrices and fungi that possess this formidable character. They owe it to their relatively low virulence on the one hand and to their powers of resistance to the self-sterilising properties of the human body on the other.

It is only germs of relatively low virulence combined with considerable powers of survival in the tissues that can settle down in " competitive symbiosis " in the human or animal body, and in the case of such germs the character of the " symbiosis " will vary with variations in the mutual adaptability of parasite and host.

Taking, for instance, the human tubercle bacillus, the " competitive symbiosis " is one in which the " competitive efficiency " of the parasite varies with the species of animal host in which it finds itself. In the cow or the rabbit the " competitive efficiency " of the host outstrips that of the parasite, the latter being gradually eliminated. In the monkey or guinea-pig the parasite wins and the animal host perishes. In man the parasite and the host are so

evenly matched that accidental factors, such as amount of the initial or subsequent doses of infective material, the age of the host, or an environment favourable or the reverse, may finally decide the issue.

But these accidental factors cannot be other than indirect in their action. They bring about their effects through their influence on a much more intricate machinery. In the final resort it is the competitive powers of the host and the parasite respectively that matter. A man may be as susceptible as the guinea-pig or as resistant as the ox to the human tubercle bacillus; and it is my thesis that this state of susceptibility or resistance depends not on inborn characters, as in the case of the guinea-pig or ox, but upon the want of, or development of, a relative immunity, only to be acquired through successful competition with the germ.

That such a relative immunity can be acquired even by susceptible animals has been proved by Calmette and others working with bacilli of reduced virulence. All that is necessary is that the " competitive efficiency " of the parasite shall be reduced below that of the host by prolonged culture on bile media, and relative immunity instead of fatal disease follows inoculation of the living and attenuated culture.

At this point it may, perhaps, be suggested that these considerations have their bearing in preventive rather than in clinical medicine. A moment's thought will show that this is not the case. Much work is still necessary before we shall be justified in advocating " living vaccines " in the prevention of tuberculosis, and it is only with living bacteria that satisfactory prophylactic immunity has as yet been attained. But with regard to the symptomatology of the disease, the importance of these concepts appears to me to be fundamental.

The reason of this is that bound up with and forming part of the processes of acquired immunity is the character

of " reactivity," " hypersensitivity " or " allergy," that character which makes the tissues of the host intolerant towards the bacterial protoplasm of the parasite, and which therefore determines the symptoms of the disease.

Let us briefly consider the applicability of this concept to tuberculosis.

The first point that requires to be emphasised is that the so-called " toxin " of tubercle bacilli, tuberculin, is without appreciable effect on the uninfected human or animal body. Relatively large quantities can be inoculated into the newly-born infant or into the guinea-pig without causing any symptoms at all.

It is only when the human or animal body has been rendered intolerant by infection with the tubercle bacillus that tuberculin becomes for it a toxic substance. In other words, tuberculin causes no symptoms by itself. It only leads to symptoms when the cells or humours of the body react to it.

It was the discovery of this fact through the severe local reaction noted on inoculating dead tubercle bacilli into an already infected guinea-pig (Koch's phenomenon) that led Robert Koch to search for and ultimately to produce tuberculin.

As with tuberculin, so with tubercle bacilli, no symptoms are produced except through the reaction of the host.

If a young guinea-pig is inoculated with a large dose of living human tubercle bacilli there is no immediate symptom of illness. The weight continues to increase, the animal feeds as usual, and for some days there is nothing to suggest that the guinea-pig is doomed. But by degrees the tissues begin to react, the temperature becomes irregular and the weight begins to fall. At or shortly before this moment an intra-dermal inoculation of tuberculin will evoke a local reaction. The animal has become " intolerant " or " allergic," and this

"intolerance" appears to determine the symptoms of infection.

In an already infected guinea-pig the effect of a further inoculation is not slow in appearing, but is rapidly manifested by a massive local swelling with a tendency to caseation and breaking down so as to form a fistula.

Reaction, then, takes the form of rapidly produced local inflammation at the point where the antigen has been injected, together with certain symptoms that depend upon the products of the interaction between the parasite and the cells or humours of the host.

This inflammatory reaction tends to "localise" the germs and keep them immured at the point of reaction by the building around them of the cellular barriers seen in every "tubercle."

Giant cells have been reported by Wolff Eisner as present at the site of a Von Pirquet skin reaction, thus suggesting the close relation between the tuberculin and the bacteria that produce it as well as between the reaction to each.

Here we arrive at a conception of great importance. Where there is resistance the allergic reaction eventuates in changes which tend to localise the germs and keep them "localised," symptoms, both local and general, being definite. Where there is no resistance, no reaction, the germs are able to disseminate widely from the point of entry, the symptoms at first being slight or absent.

The application of these conceptions to the interpretation of symptomatology in human tuberculosis is full of interest.

It is common knowledge that, apart from a small number of exceptional cases, the general symptomatology of tuberculosis shows well-marked differences in different age-groups in this country.

In early infancy the disease is seldom recognised, so

insidious is its clinical course and so few its symptoms; and yet it is nearly always generalised and tends to be fatal.

In childhood the presence of extensive infection may fail to give rise to any definite symptoms until some local reactive process occurs. The characteristic feature of tuberculosis in childhood, apart from the frequency with which it affects lymphatic glands, is its tendency to become generalised through the body. As a result we find in childhood that, apart from adenitis the commonest lesions are tuberculous meningitis and affections of the bones and joints, lesions that can only occur after the generalisation of the infection, chiefly by way of the blood-stream.

In these generalised infections in childhood the constitutional disturbance is frequently minimal. A glance into the wards at Alton, Oswestry or Carshalton will reveal dozens of well-nourished, rosy children immobilised on Thomas's splints or other appliances because of extensive tuberculosis of the spine, the hips, the knee, or perhaps all three at once—generalised tuberculosis with hardly any symptoms. Like the inoculated guinea-pigs, their weight is steadily rising although they are infected with a general disease. Unlike the guinea-pigs, they will probably continue to increase in weight, and with appropriate orthopædic treatment finally completely recover, probably because the initial dose was, in them, not relatively so massive as that injected into the guinea-pig.

In other words, the tuberculosis of infancy and childhood is in general a disease of non-allergic tissues, a disease that gives rise to few constitutional symptoms and yet tends to diffuse widely throughout the body.

The tuberculosis of adults, on the other hand, exhibits the character of "intolerance." Localisation in the lungs, with inflammatory phenomena around the foci, is the rule; and with this tendency to localisation goes a symptomatology

which, though liable to variations, is still so definite that the constitutional symptoms are often of themselves more valuable in diagnosis than physical signs. This is the tuberculosis of allergic tissues.

Between childhood and adult age lies the period of adolescence, and it is here that the two main factors of infection and resistance are subject to violent disadjustments of balance. It is at this stage of rapid growth and severe physiological strain that the infections contracted during childhood and still existent in lymphatic nodes and other foci tend to assume fresh activity; and it is at this period that the individual, quitting the shelter and isolation of home, is exposed to the risk of close contact with infective persons in the course of business or education. The resistance at this stage appears to be, in many cases, just sufficient to localise the infection in the lungs and to evoke symptoms, but insufficient to prevent the rapid spread of the disease locally by the extension and coalescence of foci. Thus it comes about that, especially in the case of young females just emerged from the relative isolation of home life, and of young lads from country districts, we frequently encounter a very rapid and fatal type of pulmonary tuberculosis—the clinical entity that underlies the "young adult" type of mortality to which the statistical researches of John Brownlee have directed attention.

The pathological changes that express these different phases of acquired resistance or the absence of it are very characteristic.

It seems certain that in the virgin soil of infantile tissues the tubercle bacillus can pass through mucous membranes and along lymphatic channels without exciting any reaction at all in the first instance. It is only when arrested in the nearest lymph node that the germ begins to multiply and to poison surrounding cells by its products, with the result

that its antigenic effects become operative in generating some degree of resistance.

This process can be followed in the guinea-pig by the installation of a drop of living bacillary emulsion into the conjunctival sac. There is at first no conjunctivitis, but the animal develops cervical adenitis and then general tuberculosis. In an experiment of this nature recently carried out by me the eye became acutely inflamed towards the end of the fourth week, a few residual bacteria perhaps exciting an allergic reaction when a measure of resistance had developed.

In tissues that have become slightly resistant, but not sufficiently so to control and limit the spread of infection in the ineffectively allergic soil of the inoculated guinea-pig for instance, the presence of tubercle bacilli tends to excite the formation of extensive areas of homogeneous granulation tissue not unlike those characteristic of the lesions in actinomycosis. This stage is seldom seen at necropsy in human subjects, as the infection has usually lasted long enough, even in infants, to excite the formation of characteristic tubercles surrounded by a zone of cellular reaction, or to the further stage of fusion of foci, death of tissues and caseous degeneration of fairly extensive areas.

In the highly resistant individual the cellular proliferation soon leads on to the formation of fibrous tissue, and to the isolation of infected areas within cellular and fibrous barriers that are often very successful in limiting the spread of the disease, though they may themselves cause mechanical damage and inconvenience, and may even assist secondary infections by shutting out the blood and humours from diseased foci.

The conception, then, that I wish to express is that behind clinical type in tuberculosis lie these two main factors of infection and acquired resistance, upon the relative

preponderance of which largely depend the manifestations of the disease.

To revert to my conception of "competitive symbiosis," where the "competitive efficiency" of the parasite is greatly in excess the progress of the disease will be rapid and the tendency to generalisation of infection will be well marked: where, on the other hand, the "competitive efficiency" of the host is excessive the infection will be either eliminated before it can even make its presence known or else localised by fibrous barriers and unable to progress. In between these extremes will be found the majority of clinically recognisable cases, and in prescribing treatment or in attempting to forecast the issue of the disease the wise physician will give close attention to the degree of resistance possessed by the patient. There is a common tendency to lay too much stress on physical signs and too little on more subtle indications. The real clue to the case lies in the patient's responses to auto-inoculation on the one hand and to rest on the other, these responses being considered in relation to the extent of the disease. In my opinion Inman's classification is one which should be applied mentally by every physician to every case of pulmonary tuberculosis with which he has to deal. If a patient is "resting febrile" it may be safely assumed that the competitive efficiency of the parasite is in excess, and the prognosis must be very guarded even if the physical signs are minimal. The "ambulant afebrile" case, even with extensive disease, is one in which a high degree of resistance has been acquired. That it has been acquired is certain, for had it existed as an inborn character the degree of resistance that can even now curb and control extensive disease would have been sufficient to prevent its development in its early stages.

For the "ambulant febrile" patient the issue is in the

balance. It is here that the judgment of a skilled physician finds its highest opportunity.

Finally, let it be remembered that a high degree of resistance may be temporarily masked by a still higher degree of infection.

No case is quite hopeless in this disease, though hope may seem ever so slight. We all meet now and again patients such as Cases xxiv. and xxv. of Lænnec's series in whom desperate symptoms gave place to restored health, though we may be permitted to find the explanation in acquired resistance rather than in "sulphur baths, astringents and asses' milk."

Critical Review.

THE PHYSIOLOGY OF DIET AND HYGIENE AT THE NORTH POLE.

TALES of polar adventure interest most men from the mere recital of human endeavours and of hardships endured, but they have a special appeal to the medical mind. It is sometimes a relief to escape from the atmosphere of infectious disease, and apart from gastro-intestinal disorders, illness is rare in these latitudes. The Scott expedition, for example, enjoyed freedom from such complaints until the opening of a bale of clothing, when an epidemic of coughs and colds occurred.

The points of special interest to the medical reader are those relating to dietary, personal hygiene, and housing.

Vilhjálmur Stefánsson, the leader of the Canadian Arctic expedition (1914 to 1918), would appear to have solved these problems for the northern regions. In his book[1] this explorer records the work accomplished during a period of five years, and at the same time seems to destroy deliberately and with intent many of our illusions as to the dangers, discomforts, and hardships met with in this charmed circle. Some acquaintance with the literature of Antarctic travel inclines one to the belief that the latter continent will remain still, in the classic phrase, deliberately unfriendly.

[1] *The Friendly Arctic*, by Vilhjálmur Stefánsson.

As a preliminary to understanding the problem of life at the North Pole, Stefánsson advises us to forget what we think we already know. "Unless it be religion, there is no field of human thought where sentiment and prejudice take the place of sound knowledge and logical thinking so completely as in dietetics." Thus Stefánsson, who enunciates the principle that the essence of dietetics in the North is to choose a complete food, *e.g.* fat caribou or seal meat, and to avoid variety in the diet. We can well believe that he had great difficulty in persuading his fellow-travellers to act up to these theories. Peary, with a standard diet, remarks that his men ceased to grumble after the second week. Stefánsson found his men liked the unchanged diet better the longer they were confined to it, and he states that it is easier to persuade men "well brought up," *i.e.* accustomed to a varied liberal diet, than men "poorly brought up," *i.e.* used to only half a dozen or so articles, to carry out what was really a dietetic experiment. He was, in fact, adopting the ideas of the inhabitants of these parts, the Eskimo and the polar bear. Now the physiologist states we must have so much protein, fat, carbohydrates, salt, and water of 2,500 calories or so value. The polar bear obtains his requirements from seal blubber almost exclusively, and moreover avoids in this way all the evils of excess of protein. All practical experience supports the contention that there is a great need for fat in the Arctic diet. The caloric value of fat is more than double that of any other food, and to obtain the equivalent of 1 lb. of fat 2¼ lb. of sugar is required—no small addition to the weight of rations. Stefánsson remarks that four centuries ago, before sugar was known in Europe, the phrase to "live on the fat of the land" had some significance. However, it has none now; we live on the carbohydrates of other lands. What is not generally appreciated is that there are degrees of flavour in fat, palatability depending on the site of origin. Thus the *bonne-bouche* in caribou is the retro-ocular and patellar fat; this applies to unseasoned, underdone boiled fat. Marrow is softer and more palatable the nearer it is to the extremity of a limb.

The standard polar ration of previous expeditions allows very little variety:—

Peary's: Pemmican, 1 lb., ship's biscuits 1 lb., condensed milk 4 oz., compressed tea ½ oz. Total, 36½ oz.

Scott's: Pemmican 12 oz., biscuit 1 lb., sugar 3 oz., butter 2 oz., compressed tea 7 oz., cocoa 0.6 oz. Total, 34.3 oz.

Pemmican is a prepared and condensed food consisting of beef, fat, and dried fruits. Its most essential constituent is fat. Scott's supply contained 60 per cent., and was found most satisfactory. Stefánsson considers it should contain at least

50 per cent. fat. Some of his pemmican, deficient in this respect, caused serious ill-health to the men and actual starvation to those dogs living solely on pemmican. Viewed from the standpoint that the diet was too rich in protein, the author states that "protein poisoning" occurred. "This leads to nephritis or derangement of the kidneys, of which a common symptom is swelling of the body, beginning usually at the ankles." Whilst fully cognisant of the fact that excessive protein intake causes renal irritation (the eating of 2 lb. of beef-steak by healthy men has been followed by microscopical hæmaturia), a more likely explanation of the swelling is *hunger œdema*. Briefly stated, this condition is due to a combination of semi-starvation and hard muscular work; the essential lack in the diet is either fat or special vitamine, such as fat-soluble A. In the case under consideration the two factors, hard work with severe exposure, and deficient fat in the food, were present for at least five months. Indian tribes in Canada and Hudson's Bay men occasionally have to live mainly on protein (lean meat); they refer to it as starvation.

Stefánsson finds that the standard polar diet produces thirst, and although this can be easily quenched by snow, he considers it is preferable not to become thirsty. But his chief objection is that a prepared food, such as pemmican, requires to be transported many miles from civilisation, and that it takes up valuable sledge room in the Arctic zone. The greatest service rendered by him to future North Polar expeditions is the development and proof of his theory that it is possible always to live "off the land" even if afloat on an ice floe in the Arctic Ocean, providing always that the explorer is an experienced hunter, capable of immense physical efforts and learned in the science of polecraft. If on the sea ice, the food supply is mainly seal and to a less extent polar bear; if on land, there are abundant caribou deer and many polar oxen. The broth in which the meat selected is cooked provides the desirable hot fluid.

Three cases of scurvy resulted from a diet of "groceries." Definite symptoms were noticed at the end of three months. Stefánsson gives them as follows: failure of strength but not of appetite as an early sign; irritability ("showing itself in a tendency to condemnatory and uncalled-for argumentativeness"); dizziness on standing; disinclination for exertion; and depression. It would, one imagines, under the conditions of life in the Arctic, be quite possible to have some of the above symptoms apart from scurvy, but the well-known physical signs of swollen and loose and aching teeth would help to differentiate the two conditions. Slightly cooked or raw fresh caribou meat and marrow effected a quick cure in

about three weeks. In the Scott expedition seal blood was used by Dr. Atkinson for a similar purpose.

It has often occasioned comment that a scurvy patient hankers for salt, and that this longing disappears as the cure proceeds ; but no explanation can be given. Although it has long been recognised that salt meats predispose to scurvy, the relationship of salt to the disease is considered to be only indirect. Many Indians and Eskimos find salt unpalatable and do not use it at all. The rôle of salt in the civilised world is so universal that few have ever been in the position to appreciate its absence, as were some of the members of Stefánsson's expedition. The greatest longing was felt after some two or three weeks' deprivation ; but after being without it for some time, six to eight weeks, the men did not want it. Salt has once furnished the material for an entry in an explorer's diary. Bowers' of Scott's expedition, wrote on January 25th, 1912 : "I am in tribulation as regards meals now, as we have run out of salt, one of my favourite commodities." He goes on to say that he "will only have to *endure* another two weeks without it."

Peary (from experience) would have no one who smoked or required alcohol. The objections to tobacco were that it had a bad effect on the "wind," that it was an additional and useless weight to carry, that it vitiated the atmosphere of the igloo, and, doubtless the soundest reason of all, that the smoker is a nuisance to himself and others when his supply gives out.

The thought of starvation has been robbed of some of its terrors since hunger-striking became so effective a reply to the majesty of the law. And it is a familiar fact that the preliminary hunger caused by missing the first meals does not become more but slightly less compelling as time elapses. Stefánsson states that after continued strenuous exertion—walking 20 to 30 hours—without food, he became no more hungry than if he had missed a meal by a few hours—a tribute to his physical fitness, and an experiment suitable for confirmation by some keen student. Like everyone else, if in camp he could eat every four hours or so, and it annoyed him to find that his men could not be persuaded that a man does not collapse from hunger if he fails to get a snack every few hours. He found, to his surprise, that the greatest irregularity had neither the effect of diminishing nor of increasing hunger. In the North one gets hungry sooner if one gets cold : this seems no unusual experience.

Hitherto explorers confronted by a shortage of rations have kept, in Stefánsson's opinion, the sensation of hunger tantalisingly acute but never at bay by going on half rations or less. He himself, under similar conditions, would continue on full

rations and trust to the North to provide his food. This philosophy would be of no use to the explorer in the South.

A belief that has handicapped polar explorers in the past is the idea that if a man goes to sleep when lost he never wakes, the cold being supposed to induce sleep. This is contrary to our everyday experience that it is impossible to get to sleep if we are cold; as a matter of fact, if we become cold when asleep we wake up. The keeping awake at all costs resolves itself, he considers, into walking quickly up and down in semi-panic; perspiration makes the clothing a good conductor of heat; until at last further loss of heat and exhaustion usher in the final sleep. Stefánsson, when in the open, found he could not sleep more than a quarter of an hour without being woken because of feeling chilled.

One of the alleged hardships of life at the poles is the long spell of darkness which has to be endured (110 days). Captain Evans writes, "It was difficult to imagine that in three months there would be no sun, and that the cold dark winter would be upon us." This from an R.N. Officer on his fourth Antarctic trip! But to the Eskimo it is the social period; during the winter he visits his friends and relations, and his wife alone works. In fact, one Eskimo privately regarded this dread of the darkness as one of the peculiarities of white men which he did not understand. The feeling that darkness is to be dreaded is apparently a question of temperament: the Manchurian ponies of Scott's expedition cheered up greatly with the return of the sun, the officers of the expedition drank champagne, and Bowers composed poetry. Peary was the first to realise that the late winter is the best time for a sledge journey; March and April, with intense cold and perpetual light, are the best months.

It is a mistake to consider the Arctic lifeless or silent. There are meadows and grass-eating animals (polar oxen), abundant flowering plants, and mosquitos to plague the life of man and beast. Noise is supplied by the crunching of the ice-floes of the polar pack. On the Antarctic continent all writers note the absence of life and even noise in that "sad, frozen land." Amundsen, on his return journey from the South Pole, records apparently with pleasure the fact of seeing a skua gull, significant of the near neighbourhood of the coast. However, so far inland as 200 miles from the Pole, Evans records without comment that a skua gull was seen.

Even at the North Pole the housing question affords, most appropriately, material for heated discussions. Stefánsson condemns the double silk tent except for summer and for temporary use. For him the snowhouse or igloo, built as by the Eskimo. Two important modifications, however, are made

by him; first, the door is on a level with the floor, or a little below it, and in accordance with the principle that hot air, being lighter than cold, rises, the cold air in the doorway remains there, and, it is stated, no draught results; secondly, a hole is made in the roof for ventilation, its size depending on the requirements of the inmates (*i.e.* whether sleeping or cooking) and on the conditions of external temperature. It is from the Eskimo-inhabited igloo that the classical specimens of solid atmosphere come; his test for the need of more oxygen is either the lamp going out, or a colleague developing the convulsions of asphyxia. Yet he can smell the smoke of a single dwelling when eight miles away! Such snow houses were built by the explorer's party just within an hour, and it is hardly credible that the kerosene or seal oil stove easily maintains a warmth within the house of 60° to 80° F. While Europe and America were on fuel rations in the winter of 1917–18, his men were sitting in shirt sleeves in snow houses built on the floating polar ice, with unlimited fuel, *i.e.* seal-blubber.

Stefánsson devised satisfactory clothing and footwear, and also solved the problem of keeping hoar-frost out of the inner clothing. That this is an achievement of the very greatest importance to all future explorers may be gathered from the following figures. At the start of their heart-breaking trip to Cape Crozier, the three sleeping bags of Wilson, Bowers, and Cherry-Garrard weighed 471 lb.; on arrival home the weight was 118 lb. Evans, in his *South with Scott* writes most feelingly of the clammy misery his party endured. The final upshot is, that when the hoar-frost in the clothing and the sleeping bag has thawed out, the unfortunate occupant spends the night in what is practically an ice-water bath. The only occasions on which Stefánsson was unable to avoid getting wet and cold were when travelling through melting snow *in the summer!*

It may be asked: Did the Canadian party become aware of the lack of anything? Of two things only: the first, the chance of hearing good music; the second, alarm clocks. The manner in which Browning, of Lieutenant Campbell's party in the Scott expedition, overcame the latter deficiency deserves to be known. A candle burning through a thread rove through it releases a bamboo spring, which, attached to the trigger of a gramophone, starts a tune which is dinned into the ear of the required sleeper, who turns out and stops the tune. This contrivance could be timed to five minutes.

It is probably no exaggeration to say that one or more volumes exist on every polar expedition made. Yet none of them seems to comment on a matter which must be of great significance in such extremes of temperature, *i.e.* advice as to

the technique of the everyday calls of nature when on the march or in camp. As the extreme example of inclemency, let us visualise Cape Crozier with a wind on one occasion of 84 miles per hour and a temperature of 77° below zero. To the uninitiated the performance of such a requirement might attain the dignity of a polar hardship.

Despite Stefánsson's modest disclaimers, it is very clear that his great achievements are due entirely to his knowledge and ability to meet all the hard conditions of life in these zones. His lieutenant, Storkerson, also a man skilled in polecraft, was able to write as follows of one of his journeys: "We lived on sea ice uninterruptedly for 238 days, having experienced neither hunger nor thirst, danger nor hardship," *i.e.* a journey of over 200 miles on moving and treacherous ice in darkness, fog, and storm. Further, this party of 5 men and 16 dogs, leaving with 101 days' full rations, kept themselves for 8 months (96 seals and 6 polar bears were procured).

As an example of Stefánsson's personal ability, consider for a moment his method of finding camp when in difficulties. The account that follows is a much condensed description. He was in a region where only three kinds of wind blow, from S.W., from N.E., and from E.N.E. An examination of the ground will easily show which wind blew last. By observing the size and characteristics of drift, he could tell at a glance which was the S.W., which the N.E., and which the E.N.E. And if it were dark or a blizzard were blowing, he could tell the shapes of the drifts by stopping and feeling with the feet or on all fours *with the hands*. Then having determined either the N.E. or the S.W. drifts, the only problem is to cross every such drift at the required angle and you arrive at your camp. Could anything be simpler! After a performance of this kind, when he had been on his feet about 17 hours, he says: "I was, of course, not tired." He was, as he truly remarks, in good training. And he had solved an interesting problem (how not to get lost in a blizzard), he was in especially good humour, so the time passed happily.

CECIL CLARKE.

Reviews of Books.

China and Modern Medicine. By HAROLD BALME, F.R.C.S. Pp. 224. London: United Council for Missionary Education. 1921. Price 3s. 6d.—The progress of medical science in China is a subject of great interest from many points of view. Dr. Balme has given here, in outline, the history of a movement which will have a tremendous effect on the history of Asia and

indeed the whole world. His conception of our duty to propagate the science of medicine in a nation civilised but practically devoid of any scientific knowledge cannot fail to impress his readers. Students of missionary enterprise will find in this book inspiration and abundant food for thought. To find medicine given its true place amongst the forces that exalt a nation is refreshing, and will appeal to those of utilitarian habit of thought. Suffering somewhat no doubt from the circumstances of its making, some rearrangement of matter would give a clearer idea of what is being done and what remains to be done in China, and of the author's conception of the best methods of laying the foundations of western medicine in the heart of the East. Those who have not lived there, and even some of those who have, have no idea of the tremendous difference there is between different parts of China in the degree in which western civilisation has penetrated. This is a vital point to grasp in trying to appreciate the present position of China in the family of nations, and much enlightenment herein may be had by those who read Dr. Balme's book carefully. Truly educative, this little book would be well worth a place in any library, even if it did nothing but show that the missionary has many more problems to exercise his brains than the man who stays at home.

Tumours : Innocent and Malignant. By Sir JOHN BLAND-SUTTON, LL.D., F.R.C.S. Seventh Edition. Pp. x., 806. London: Cassell and Company, Ltd. 1922. Price 30s.—We are fortunate in having a new edition of this classical book, after an interval of five years from the last. At each new edition some additional information is added bearing on tumour growth, and to the present edition are also added twenty new and very excellent illustrations. Perhaps the most striking new statement in this edition is with regard to the supposed relationship of several forms of tumour growth to internal secretion. It has, of course, for some time been recognised that overgrowth of various tissues of the body may be due to an abnormal internal secretion of the pituitary and thyroid glands, but it is now believed that actual tumour growth may be also influenced in this way. Sir J. Bland-Sutton says there is reason for suspecting that multiple exostoses are the result of disturbance of the function of the glands of internal secretion—probably the thyroid, but he does not give us these reasons. He also says multiple fibro-neuromata and chondromata also probably depend on some disturbance of the endocrine glands, and that glandular disturbance of the hypophysis may cause multiple uterine fibroids. So that he considers multiple exostosis, chondromata and fibro-neuromata, and uterine

fibroids may all be due to some abnormal conditions of internal secretion.

We are interested to notice that in the description of myeloma the author also describes the condition which has led to so many errors of diagnosis—errors which in a few cases have cost the patient the loss of a limb—innocent cysts of bone, and gives an illustration of a pathological specimen of one of these cysts from the College of Surgeons' Museum. He seems to consider that such a cyst may in some cases be really the remains of a myeloma. Of course, a myeloma may contain degeneration cysts, but it seems to us that it would be almost impossible to prove that an innocent cyst of bone started as a myeloma unless there were traces of the solid growth also present in a typical form, and not merely the presence of some giant cells in the wall of the cyst, where they are frequently found. Although, of course, on a strictly pathological basis a distended gall-bladder and a hydronephrotic kidney are as much retention cysts as a distended sebaceous gland duct, yet we regret that such conditions should still be described as such, and therefore included in this book on tumours. It is rather surprising that the " mixed tumour " of the testicle should not be described as an embryoma, which the latest investigations seem to indicate is its true nature. A very striking change in this new edition is that endotheliomata are no longer described. In the 5th edition such a tumour was described as occurring in eight different localities. This edition was published at the time when it was the fashion amongst pathologists to label any tumour of unusual microscopic structure an endothelioma. It has always seemed to us that it would have been better to have limited the scope of this work to the pathology of tumours, and not to have included their " clinical characters and appropriate treatment " in any detail. The clinical aspect of cancer of the stomach, colon, and rectum, and the advantages and risks of various forms of operation, have always seemed to us rather out of place in the book. It would have been better to omit it, for as we might expect it is not dealt with in really a thorough manner, as it is in the larger works dealing with abdominal surgery. But this new edition of Sir J. Bland-Sutton's book makes us realise afresh that the work is a large storehouse of knowledge with regard to the character of various tumours, and their relationship to each other and to allied morbid conditions; and its great originality, and the tendency of the author to dismiss as unproved various theories inadequately supported by facts, strikes us anew in this last edition.

The Venereal Clinic. By Several Writers. Edited by ERNEST R. T. CLARKSON, M.A., M.R.C.S. Pp. xvi., 477. London: John Bale, Son & Danielsson Ltd. 1922. Price 25s.

net.—This book serves to supply a deficiency in the literature of Venereal Disease in a most effective manner. It gathers up the essential points of all kinds, and places in the hands of all who are called upon to treat such cases the details which are required to make a satisfactory diagnosis by the most recent methods, as well as how to carry out treatment by the most up-to-date technique. It is not intended to be a comprehensive and exhaustive monograph, but as a "manual for the general practitioner and student attending Venereal Clinics." A short description is given of the diseases encountered and the essential points in diagnosis, the reader being carried along as with a case before him. In this way all the complications are considered and dealt with. The urethroscope is specially described, while bacteriology and laboratory methods are considered. The sociological and administrative aspects of the subject are given due place and medico-legal matters are not omitted. The book is well illustrated and printed, and can confidently be recommended to all students and persons interested in this section of medical practice.

Anæsthetics in Practice and Theory. By J. BLOMFIELD, C.B.E., M.D. Pp. xii., 424. London: William Heinemann (Medical Books) Ltd. 1922. Price 25s. net.—Owing to his large experience and his philosophical turn of mind, Dr. Blomfield has succeeded in producing a work of exceptional value and attractiveness; in short, the book presents a very readable picture of the speciality, and blends old and new material without loss of perspective and with a remarkable absence of bias. The chapter on chemistry deals fully only with such bodies as are in common use, including Ethanesal, and explains that many of the substances with which Snow and others have experimented are not true anæsthetics as judged by the modern therapeutic standard. In discussing the physiological action of the various agents the author relates much of the experimental work published at home and abroad, but is careful not to commit himself to any opinion, except, perhaps, to favour the theory that anæsthesia depends upon an alteration in the nerve cells, but he does not attempt to show how this view can be reconciled with the fact that vegetable organisms can be anæsthetised. The section on administration is full of practical information, and will be appreciated, as helpful, by practitioners and students alike. The rather vexed question of when to use and when to avoid preliminary narcotic drugs is given careful consideration, and evokes a warning as to the danger of abolishing or unduly subduing the laryngeal reflex in the subjects of mouth and tongue operations. Local, spinal and sacral analgesia are dealt with at some length with clear descriptions of their respective techniques. In discussing the fatalities of anæsthesia the

author lays stress on the truth of the "dictum" of the Anæsthetics Committee of the British Medical Association, which regards the anæsthetist's experience as the most important factor concerned, and he makes the significant comment in the following sentence: "Many a death which seems sudden to the administrator has that appearance only because he has not perceived early enough the indications of approaching danger." We feel confident that this book will quickly become very popular.—A.L.F.

The Dictionary of Practical Medicine. Edited by SIR MALCOLM MORRIS, K.C.V.O., FREDERICK LANGMEAD, M.D., F.R.C.P. Lond., and GORDON HOLMES, C.M.G., C.B.E., M.D. Dublin, F.R.C.P. Lond. London: Cassell & Co. Ltd. 1921. Three Volumes. Price £5 5s. od.—These books are written for the general practitioner, and are essentially practical in character, the chief aim being to assist him in the recognition and treatment of disease. Therefore each article lays more stress on symptomatology, diagnosis, prognosis and treatment than on etiology and pathology, though the two latter are not unduly ignored. They are copiously illustrated by plates, many of which are coloured, and also by other figures. The articles are arranged in alphabetical order, making it a very ready book for reference. The individual articles, written by over a hundred different contributors, are well up to date, and not only include general medicine but also such subjects as Immunity, Anæsthetics, Clinical Bacteriology and Pathology, the modern developments of Chemical Pathology, the Examination for Life Assurance, Forensic Medicine, Dermatology and Gynæcology. It is a work which we can heartily recommend to any busy practitioner.

Functional Nervous Disorders. By DONALD E. CORE, M.D., M.R.C.P. Pp. xvii., 371. Bristol: John Wright & Sons Ltd. 1922. Price 25s. net.—This book deals with classification and treatment. With regard to the former, the author adopts a classification based on evolutionary data, dividing functional disorders into regressive and progressive varieties. In the regressive group he places hysteria, which is further subdivided into primary, secondary and tertiary forms. In the progressive are placed, firstly, the sympathetic functional nervous disorders, namely the instinct-distortion neurosis, which are termed dysthymias, (*a*) confusional, or centrifugal, (*b*) introspective or centripetal, and, secondly, symptoms arising in the atmosphere of dread, comprising (*a*) the ordinary form of mnemoneurosis and (*b*) the obsessive form of mnemoneurosis. The first part of the book is devoted to general considerations, which include the behaviour of man compared

with that in the lower animals. This is an important section. Subsequent parts consider in detail hysteria, the sympathetic nervous disorders, dreams, diagnosis, prognosis and treatment. There is a great deal that is original in this work, and much careful thought has been devoted to it. It is, however, too verbose in form, and many of the sentences are difficult to follow.

A Glimpse into the History of the Surgery of the Brain. The Thomas Vicary Lecture. By SIR CHARLES A. BALLANCE, K.C.M.G., C.B., M.V.O., M.S. Lond. Pp. 110. London: Macmillan and Co. Ltd. 1922. Price 10s. 6d. net.—The first half of this work is a brief survey of the general history of surgery, with occasional reference to the history of the surgery of the brain, doubtless because little was known of the latter subject apart from the very ancient practice of trephining and the Hippocratic methods of dealing with injuries of the head. In this connection, however, it might have been worth while to mention the fact that the Hippocratic school did not trephine for depressed fractures, and that the use of the trephine for such fractures of the skull was recommended by Avenzohar (A.D. 1113–1162), the teacher of the celebrated Averroës. The latter half of the book deals more consistently with the title of the lecture, for brain surgery, like general surgery, was based on sounder principles with the revival of anatomical knowledge in the Middle Ages. The work of Ferrier on localisation and the operative application of physiological and anatomical facts by such men as Horsley and Macewen marked a new epoch in the advance of brain surgery, and the author rightly claims that "during every decade since 1881 . . . the surgeon's art in cases of intracranial disease continues to triumph along many lines of advance." As a whole the book gives a clear but brief account of what is known of the history of the surgery of the brain from the earliest times to the present day. There are thirty illustrations, many of them being portraits of well-known pioneers of surgery.

Ashby and Wright's Diseases of Children, Medical and Surgical. Sixth Edition. Pp. xxvii., 796. London: Oxford Medical Publications. 1922. Price 42s. net.—This is the sixth edition of a well-known book written for senior students and junior medical practitioners. The original authors are both deceased, and the present book is a revision by Dr. H. T. Ashby, a son of one of them, in conjunction with Mr. Charles Roberts, F.R.C.S. The volume is a systematic text-book on pediatrics, and is concerned with diagnosis and treatment, the subject-matter being illustrated by a number of excellent plates. One of the earlier chapters deals with a most important and

interesting branch of the subject, namely infant feeding, and abounds with much excellent advice and common sense; for example, under a description of the calorimetric method of feeding the authors state: "These calculations have been of value in giving a general idea of the quantity of food a baby needs, but in a calorimeter a baby does not behave like a baby in the nursery." Under this section the authors lay stress on the importance of regularly weighing infants. In a later chapter the writers are old-fashioned and wise enough to believe that there may actually be disorders of dentition, and furthermore include formulæ for medicines to treat such disorders. Certain other chapters are worthy of special commendation, notably that on Rickets; there is always a tendency either to exaggerate the importance of new discoveries or to ignore them, and it is gratifying to see that hygienic and climatic influence and environment are here considered to play at least as important a part as the accessory food factors in the etiology of this disease. The section on Diphtheria is also specially well written, and the important question of immunisation after the application of the Schick test is discussed. There is little need for serious criticism in any particular direction, but brief reference may be made to a few rather important points. Under "Delayed Chloroform Poisoning" and "Cyclic Vomiting" the word "acidosis" is used, and although the presence of acetone in the urine in these cases is referred to, no reference is made to the differences between "acidosis" and "Ketosis." The subject of "Tetany" and other spasmophilic conditions is worthy of fuller treatment, and, incidentally, no reference is made to the connection between tetany and the parathyroid glands. We also think that the use of the word "Eczema" to describe a clinical entity is hardly desirable. The book concludes with a helpful chapter on Radiography in Children by Dr. W. J. S. Bythell, a chapter on the teeth by Mr. B. J. Rodway, and appendices on methods, preparations, and formulæ. The authors are to be congratulated on their lucid method of presentation, the publishers on the clearness of the type, and both on the general excellence of the work as a whole.

What to do in Cases of Poisoning. By WILLIAM MURRELL, M.D., F.R.C.P. Twelfth Edition. Revised by P. HAMILL, M.D., D.Sc., F.R.C.P. Pp. 273. London: H. K. Lewis & Co. Ltd. 1921. Price 4s. 6d. net.—In forty years Murrell's little pocket-book has established itself as a universal favourite. Each edition appears to be sold out in about three years. Every doctor in the country knows the book. It only remains for us to announce the issue of an up-to-date new edition ably edited by Dr. P. Hamill.

Analyses and Energy Values of Foods. By R. H. A. PLIMMER, D.Sc. Pp. 255. London: His Majesty's Stationery Office. 1921. Price 6s. net.—The necessity for rationing food during the War directed public attention to the nutritive and energy values of the foodstuffs consumed. The Army Medical Authorities directed Dr. R. H. A. Plimmer (then a captain attached to the Directorate of Hygiene in the War Office) to draw up an exhaustive analytical report dealing with the subject. Dr. Plimmer's careful work will give this report a value far outlasting the War. It will probably be the standard reference book for the British Empire. For determining diet scales for institutions or for planning special diets for patients these tables are invaluable. The cost is very small, but the paper and type are excellent. Great credit is due to the War Office for authorising and to Dr. Plimmer for compiling these tables.

Blood Transfusion. By GEOFFREY KEYNES, M.A., M.D. Pp. vii., 166. London: Oxford Medical Publications. 1922. Price 8s. 6d. net.—This is a very interesting little book. It gives a clear account of the indications for blood transfusion and the best methods. These have often been given before, but the present volume is convenient. In addition, there is an interesting account of the history of the operation, and some valuable information about the national distribution of the four blood groups and the way in which they fit into Mendel's Law. Amongst Westerns Group II. is common; amongst Orientals Group III. Group I. means that the individual carries the factors that produce both the Group II. and the Group III. reaction; Group IV. means that both these are absent. It is well known that members of a family may belong to different blood groups, and the inheritance follows Mendel's Law. Thus if both parents are Group IV. the child cannot be anything but Group IV., and if the child belongs to Group I. it is strong evidence of illegitimacy; so too if the parents are both Group II. but the child is Group I. or III. The very important point is made, which I have observed myself, that a first transfusion for pernicious anæmia may be very successful, but a second transfusion long afterwards *from the same donor* may give rise to hæmoglobinuria, apparently from anaphylaxis. It is erroneously stated on page 121 that O. H. Robertson introduced the citrate method into the British Army in 1917. I am sure my friend Robertson would be the first to point out that we had been using the technique at a Casualty Clearing Station for months before we had the pleasure of welcoming him amongst us, and were already using the bottle method, which he slightly modified.—A.R.S.

Editorial Notes.

Vol. XL.

After "seven lean years," 1915 to 1922, with this issue the fortieth volume of our *Journal* enters a new year, and we trust a new era, for we are resuming our pre-war plan of publishing four quarterly numbers. We have been through troublous times, for during the Great War the meetings of the Society were relatively few, most of our members being either abroad on active service or deeply involved in military duties or taking work for colleagues so engaged. The Armistice and the days of declared peace did not end our difficulties, as the immensely increased cost of printing and even of paper placed insuperable obstacles in the way of producing the *Journal* on the old-time scale, the Society being, therefore, compelled to restrict the size and number of its issues. Nevertheless, we have cause to be thankful that we have survived vicissitudes which all Medical Journals have suffered from and in some cases succumbed to, and for this we are indebted to the support afforded by the Society and in no small measure to the helpful co-operation of our publishers and printers.

Our first Quarterly number appearing in January, we are thus enabled to begin the volume with the Presidential Address, and the succeeding issues will be published in March, June and October.

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Boylston Medical Prize of Harvard University.

The Boylston Medical Committee of Harvard University announces that for 1922 there is offered a prize of five hundred dollars and the Boylston Prize Medal for the best dissertation on the results of original research in medicine, the subject to be chosen by the writer. The Boylston

Prize Medal will be added to the money prize only in case the winning essay shows special originality in the investigations detailed.

These prizes are *open to public competition*, and in awarding them preference will be given to dissertations which exhibit original work, but if no dissertation is considered worthy of a prize the award may be withheld.

Each dissertation must bear, in place of the author's name, some sentence or device, and must be accompanied by a sealed packet, bearing the same sentence or device, and containing the author's name and residence within.

Any clue by which the authorship of a dissertation is made known to the Committee will debar such dissertation from competition.

Dissertations must be printed or typewritten, and their pages must be bound in book form.

A similar announcement will be made for 1923.

Dissertations entered for this prize must be in the hands of the Secretary, Reid Hunt, M.D., Harvard Medical School, Boston, Mass., on or before February 1st, 1923.

MEETINGS OF SOCIETIES.

Bristol Medico-Chirurgical Society.

November 8th, 1922.

J. A. NIXON, C.M.G., M.D., F.R.C.P., President, in the Chair.

MR. FORBES FRASER (Bath) read a paper on **"Some Points in the Surgical Treatment of the Peritoneum"** (*vide* pp. 29 to 41).

THE PRESIDENT hoped that the modern student did not neglect to read that great classic Hilton's *Rest and Pain*. He asked why it was considered good to leave effusion in the

peritoneal cavity whereas the pleura looked after itself better when left dry. He thought in pneumococcal peritonitis convalescence was shortened by evacuating the fluid early.

MR. LANSDOWN described the routine treatment of peritonitis at Guy's Hospital in his student days. He agreed with the lines of treatment advocated by Mr. Fraser.

MR. WALTERS considered the mortality rate had been greatly reduced since the introduction of treatment in the Fowler position and by rectal saline injections. The class of case in which there was present a collection of foul fluid, dark in colour, like dish water, required drainage. He gave morphia the first night and later used aspirin.

MR. CARWARDINE always drained a case of perforated stomach or duodenal ulcer, usually with several tubes. He had published a series of 13 consecutive cases with 12 recoveries.

MR. WARREN thought pelvic drainage might allow escape of fluid from other parts of the peritoneal cavity. The effusion soon lost its protective power. Exercise had to be considered as well as rest to regain health. He favoured the use of pituitrin and turpentine enemata.

DR. WALTER SWAYNE thought the more favourable modern results of treatment coincided with the introduction of aseptic technique.

MR. MUMFORD remarked that an indication for drainage was the likelihood of a fæcal fistula forming. Washing out would be advantageous in cases where there was a wide extravasation of stomach contents.

MR. CHITTY considered the improvement in the results was largely due to early diagnosis and operation. He had had a series of 16 consecutive cases of perforated gastric or duodenal ulcer all operated on and the abdomen closed without drainage, and all had made good recoveries.

MR. MOORE mentioned a successful case of treatment for ascites in Banti's disease by drainage through the femoral canal into the thigh.

MR. TEMPLE said that in the period before surgeons operated for appendicitis he had, when making autopsies, several times found isolated fœcal concretions encapsuled in fibrous tissue in the peritoneal cavity, showing that in those days the peritoneum had looked after itself in some cases of appendicitis.

MR. FRASER replied.

Obituary.

J. M. RATTRAY, M.A., M.D.

THE death of Dr. John Moysey Rattray on November 4th, aged 65, causes a gap among our older medical colleagues; for although he had retired from his practice at Frome, he retained his untiring interest in all that concerned the profession he had served so well, and that cheerful, bright, conversational power that rendered him always a delightful companion, and made one forget that he was no longer young. Indeed, he was full of interests and work to the last evening before his sudden death from angina.

Bristol was deeply indebted to Rattray, for it was he who caused Greig Smith to come to us. When as recently-fledged fellow-graduates they were talking over prospects, what to do and where to set up in practice, perchance had it not been for Rattray's finger pointing to Bristol this *Journal*, so happily initiated by Greig Smith, might never have come into being.

J. M. Rattray was born in 1857, and was the son of Dr. John Rattray, a physician of Aberdeen. He graduated in medicine at Aberdeen University in 1878. He married a daughter of the late Canon Bennett, of Maddington, near Salisbury, and leaves a widow and two sons. He settled in Frome in 1881 as a partner of the late Dr. Cockey, subsequently remaining in practice there till he had passed his sixtieth year. He was a past President of the Bath and Bristol Branch of the British Medical Association.

A keen churchman and Conservative, he took an active share in the social and political life of his adopted town. He was an unusually widely-read and literary man, and both studied and wrote on many subjects, but especially devoted his attention to historical medicine after his retirement from practice, and in September, 1921, was elected a Fellow of the Royal Historical Society. He had made great progress in the study of the History of Medicine, and had he been spared would have doubtless published the results of some of his researches.

In 1917 he was shot by a patient who was out of his mind, resulting in a united fracture of the humerus and eventually his retirement from practice. To few is it given to meet such grave misfortune bravely and without bitterness, to show indomitable spirit and turn to fresh activities.

His elder son has been in practice for a long time in the Straits Settlements, and is now in Singapore.

To his widow, who threw herself into and so thoroughly shared in the manifold interests of their life at Frome and subsequently in his retirement in London, as well as to his family, we tender our heartfelt sympathy.

P. W. W.

Local Medical Notes.

UNIVERSITY OF BRISTOL.—Students of the University have recently passed the following examinations :—

M.B., B.S. LOND.—R. B. Britton.

F.R.C.S.—*Primary Examination :* S. P. Taylor.

L.D.S., R.C.S.—*Chemistry and Physics :* G. Hazell. *Dental Mechanics :* C. Morgan, J. W. Cooper, G. Meadows. *Dental Metallurgy :* G. Meadows, G. S. Williams. *Anatomy and Physiology :* G. S. Williams, K. Huxtable, C. E. Down, J. W. Cooper, G. Meadows, B. A. Butcher, N. H. Simmonds. *Dental Anatomy and Physiology :* G. Meadows. *2nd Examination, Part I. :* D. J. Andrews, S. G. House. *2nd Examination, Part II. :* *A. J. Constance, *W. G. Smith, *H. H. Watkins.

* Denotes Qualification.